FACTORS THAT AFFECT SMARTPHONE ADOPTION BY HIGH SCHOOL STUDENTS IN GAUTENG, EKURHULENI REGION

by

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Declare that the above dissertation is my own work and all the resources that I have used or quoted have been indicated and acknowledged by means of complete references.

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SUMMARY

Technology has changed the way people conduct daily activities such as shopping, banking, organising our diaries, and learning. School management generally does not allow smartphones in the classroom because they consider them a form of distraction rather than learning. The main objective of this research is to study the impact of smartphones on high school student's performance and examine factors that can influence smartphone usage on this performance. The purpose of the study is to conceptualise a framework for smartphone usage in high schools. The study was conducted at secondary schools in South Africa, in Gauteng, in the Ekurhuleni region. The Unified Theory of Acceptance and Use Technology 2 model (UTAUT2) was used to construct the hypotheses tested in the study. The data was analysed using the Statistical Package for the Social Sciences (SPSS). Three schools participated in the study, and 259 students responded to the survey. The hypotheses that were tested in the study are effort expectancy, performance expectancy, social influence, facilitating conditions, habit, hedonic motivation, and behavioural intention to use smartphones. All the hypotheses were supported in the study, except social influence. It was discovered from this study that the main factor affecting the use of smartphones is that students do not always have resources that afford them the use of their smartphones. In addition, students are not easily influenced by others to use their smartphones. The study can help to increase awareness of learning with smartphones and can contribute to the integration of smartphone use in schools, taking into consideration the advantages and disadvantages of learning with smartphones.

KEY TERMS:

Mobile applications, smartphones, high school education, high school students, cell phones, mobile learning, electronic learning, Technology Acceptance Model, (UTAUT2).

CITATION MANAGEMENT AND REFERENCE METHOD

References were managed electronically using the Mendeley Citation Manager. The Harvard method of referencing, University of Cape Town standard, was used throughout this dissertation.

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WORDS USED INTERCHANGEABLY

Educators/Teachers/Principals

Learners/Students

Smartphones/Cellphones

LIST OF ABBREVIATIONS AND ACRONYMS

AGFI	Adjusted Goodness of Fit Index
BI	Behavioral Intention
BYOD	Bring Your Own Device
CFI	Comparative Fit Index
Chi-Sq	Chi-Square
CTP-TA	Combined Theory of Planned Behaviour and Technology Acceptance
DF	Degrees of Freedom
EE	Effort Expectancy
FC	Facilitating Conditions
GPS	Global Positioning System
H	Habit
HM	Hedonic Motivation
HTML	Hypertext Markup Language
ICT	Information and Communications Technology
IDT	Innovation Diffusion Theory
MM	Motivational Model
MPCU	Model of Personal Computer Utilisation
OLPC	One Laptop Per Child
PDAs	Personal Digital Assistants
PE	Performance Expectancy
PEOU	Perceived Ease of Use
PLS	Partial Least Square
PU	Perceived Usefulness
PV	Price value

RMR	Root Mean Square Residual
RMSEA	Root Mean Square Error of Approximation
SCT	Social Cognitive Theory
SEM	Structural Equation Model
SI	Social Influence
SNS	Social Network Site
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
UB	Use Behaviour
UI	Use Behaviour Index
URL	Uniform Resource Locator
UTAUT	Unified Theory of Acceptance and Usability of Technology

CHAPTER 1: INTRODUCTION

1.1 Background to the study

In South Africa, the one tablet per student pilot project was launched for the first time in January 2015. A few schools in Gauteng Province were chosen to participate (Sackstein & Slonimsky, 2017). Each student received a tablet that was uploaded with learning material for the entire year (Eicker-Nel & Matthee, 2014). The tablet was limited to schoolwork only. Regardless the effort taken by our government, students continued to bring their mobile devices and smartphones to school.

However Cell phones are banned in most South African schools as they are disruptive and misused by learners in the classroom (Ngesi et al., 2018). However, a study conducted by (Padayachee, 2017), indicates that principals and teachers consider cell phones in the classroom to be a distraction rather than a learning tool. If students divide their attention between lecture listening and communicating with their phones, they may miss important information from classroom lectures (Amez & Baert, 2020). The challenges such as network infrastructure, network security, technical support, equity issues and classroom disruptions led to mobile phone rejection in most schools (Ruxwana, Msibi & Mahlangu, 2018; Chisango et al., 2020).

In this study, the researcher investigates the adoption and effects of smartphone usage among high school students, the impact the device has on their studies, and how smartphones could be leveraged as a teaching and learning tool to improve teaching and learning in the classroom. Nowadays, students do not learn only with paper and books; they learn through social network sites (SNS) and media sharing sites such as Facebook, Twitter, LinkedIn, YouTube and Flickr, WhatsApp, Instagram

and Bluetooth (Chawinga, 2017:4; 2018:4; Aanchal, 2020:143; Latif et al., 2019:133). Learners interact with these sites through smartphones because they offer constant connectivity and enable authentic learning on the move. The study investigates what learners do with their smartphones during class and outside the classroom regarding their schoolwork.

Smartphones can contribute to scholars' knowledge by allowing synchronous collaboration; making equal participation possible within the classroom setting, and these can enhance students' learning attitude and performance (Pratama, 2020). The use of smartphones enables contribution by letting students participate more in the classroom (Sumathi, Lakshmi & Kundhavai, 2018). The small size and portability of smartphones would allow students to carry it everywhere they go, cooperate with each other and their teachers, and store, upload, retrieve and share information easily (Dhiman et al., 2019). The availability of low-priced implanted sensors makes smartphones cheaper and more easily accessible to students (Singh & Tomar, 2018).

1.2 Research problem

Nowadays more students carry their mobile devices wherever they go for communication and learning needs (Apgar, 2020). Viberg, Andersson & Wiklund (2021) emphasises how students' perception and use of their mobile devices to study has not been explored in detail. According to Rambitan (2015:247), learning with a smartphone has a constructive outcome on "students' critical thinking" skills.

The study of (Mutia, Gimin & Mahdum, 2020) indicates that the "science-program class that used smartphones had the higher average score of critical thinking compared with" the one that did not have smartphones. And Chatterjee et al. (2020) raise the fact that students' cognitive development is expected to improve through mobile

learning technology. Rambitan (2015:249) recommended the use of questionnaires in succeeding investigations to examine the “extent of the effect of using smartphones on the learning outcomes”. The study of smartphones was also recommended by Mavhunga et al. (2016:41), stating that more research should be carried out to study the consequences of using smartphones in the “teaching and learning process”.

A study by Darcin et al. (2016) discovered that the “social networking function is a major predictor of mobile phone obsession”. Mahsud et al. (2020) mentioned that most students use smartphones for non-academic activities in the classroom and to fight boredom. In addition, research published recently revealed more negative effects on the use of technology by students (Yoo et al., 2021). In contrast (Villani et al., 2018; Ali et al., 2019) discovered that adopting new communication technology in high school is expected to encourage student motivation, decrease student resistance to new technology, and advance the instructor-learner relationship. Moreover, Villani et al. (2018) suggest that the difference between regular mobile phones and smartphones should be investigated to find other side effects of using smartphones.

In the past studies the focus was on tangible e-learning technologies, technological affordance of smartphones and the utilisation of these in the classroom to improve instruction and gain knowledge rather than studying learner preference for mobile devices (Nawaz & Mohamed 2020; Naddeo, Califano & Fiorillo 2021). Few studies have been conducted in centres of learning and institutions of higher education to deliberate on the distinctive educational features of smartphones as instruments for instruction and learning (Latif et al., 2019; Açıkgül & Şad, 2021).

The problem is that, despite the influence and importance of mobile phones for teaching and learning purposes, there are limited or no studies on this issue in South

African high schools' context, particularly in Gauteng province. Therefore, there is a need to explore the adoption and the impact of smartphones on high school teaching and learning. Since the effects of smartphones on teaching and learning are enormous, according to Singh and Samah (2018) and Soh (2017), this supports the intent to study the adoption of smartphones on high school's learners.

1.3 Aims

The rationale of this study is to investigate the effects of smartphone use among high school students and its impact on teaching and learning, based on the outcome to generate a conceptual framework for smartphone usage, which supports student performance.

1.4 Objectives of the study

The main research question is: What are the effects of smartphone adoption and use on teaching and learning in high schools? To answer the question, the objective of the study is:

- to investigate elements of smartphone adoption and use on high school learners.
- to determine the impact of smartphone use on high school learners' performance.
- to generate a conceptual model for classroom usage to improve student performance.

1.5 Research questions

The main research question is: How does mobile phones and smartphones affect the teaching and learning in high school?

To answer this question, the following sub-questions are to be answered.

- How many students own mobile phones or smartphones in your school?
- What activities do students often use their mobile phones for outside and inside the school premises?
- What are the effects of mobile phones and smartphones on the teaching and learning process?
- What model can be developed based on the respondents' findings to assist teaching and learning in high schools?

1.6 Significance of the study

The study's outcomes apply both to smartphone designers and School Governing Bodies. Smartphone designers could use this to develop better applications in targeting students. The Council on Higher Education can use the findings to influence the minister to incorporate smartphones as a standard tool for gaining knowledge in high schools. Most studies relating to the current research have been conducted mainly with university students. Therefore, it is significant that the study of smartphone use is carried out on high school students in Gauteng province.

1.7 Limitations

This study was undertaken at secondary schools in Gauteng. This is because the time specified for the study was limited, and the costs of investigating the use of smartphones among learners in South Africa would have been enormous. The respondents include students in the selected secondary schools. The selection was carried out so that representative samples of every grade in Gauteng province is available. Furthermore, the sample can be generalised to a larger population.

1.8 Layout of the study

Chapter 1: Preamble and setting of the scene. This chapter provided the introduction and set the scene for the study.

This was followed by the purpose and goal of the study, the research problem, research questions and the study's significance.

Chapter 2: Review of Literature: Chapter 2 deliberates on the literature review on the smartphone, its evolution, the disadvantages, and advantages of using smartphones, learning with smartphones, and the use of smartphones in high school

Chapter 3: The theoretical framework adopted in the study. Chapter 3 deliberates on the theoretical framework UTAUT2 to study the learner's perceptions. The UTAUT2 model is adopted in the study to investigate the effects of smartphone use on high school learners' performance.

Chapter 4: The research methodologies: This chapter discusses the research methodologies and research techniques to address the phenomena of the study.

Chapter 5: The data presentation and analysis. This chapter consists of two sections:

> *Section A:* In this section, demographic data collected from the study is presented, analysed and discussed.
>
> *Section B:* This section presents the descriptive data and discusses the findings, including the covariance of the study's hypotheses.

Chapter 6: Conclusion and recommendations: This is the final chapter. It summarises and addresses the research outcome, discusses limitations and makes future work recommendations.

1.8 Conclusion

Chapter 1 has deliberated on the context of the research study by articulating the research problem, the research question, the goal of the study, the reason for the study, the literature review, the theoretical framework model, and the study's limitations. Chapter 2 studies the literature review study of smartphones, and the theoretical frameworks are applied in Chapter 3.

CHAPTER 2: THE REVIEW OF LITERATURE

2.1 Introduction

This chapter deliberates on the literature review of the smartphone, its evolution, the disadvantages and advantages of using smartphones, learning with smartphones, the use of smartphones in high school, and wireless technology. Alonso-Garcia, Pablo-Martí & Nunez-Barriopedro (2021:3) defines a literature review as a summary of the topic field that backs the identification of a particular research question. The purpose of a literature review is to search and evaluate the information source to develop a conceptual framework (Alonso-Garcia, Pablo-Martí & Nunez-Barriopedro, 2021:2).

2.2 Evolution of smartphones

The first generation of smartphones, “Simon from IBM”, was launched in 1993 (Lee & Lim, 2018) and sold in 1994. The second generation of smartphones was born in 2007 when Apple revealed its first smartphone (Mishra, 2017). That was the first time the industry announced smartphones for a worldwide consumer market. In 2007, Google released an Android operating system aimed at the end-user smartphone market.

The focus was to present qualities that the worldwide customer needs and, simultaneously, to keep up with the low cost to get progressively more customers (Singh et al., 2018). Smartphone devices have more powerful batteries, quality display technology and improved interface with more features. The introduction of the smartphone closed the breach between enterprise-centric and worldwide consumer-centric approaches (Singh et al., 2018). In this study, the consumers are referred to as users of smartphones. The effect is described as a constructive or destructive variation of what is envisaged.

Nowadays, smartphones are easy to programme and are made with an increasing set of low-cost, powerful implanted sensors, such as the Global Positioning System (GPS), microphone and camera (Al-Turjman, 2019). The built-in cameras capture images or videos, whereas the microphone is useful for recording audio. Saved audio and/or video are then uploaded to online blogs or any website. Teachers mostly do uploading for students to access and download information (Mutia, Gimin & Mahdum, 2020). Many smartphones contain an installed GPS that functions via satellite and is used for geotagging and geo-location. The cameras on smartphones make it easy for students to record their events and discussions, express themselves through a visual dimension, and share these expressions electronically through social media sites such as YouTube (Latif et al., 2019).

Social networking provisions are currently more than websites because they offer numerous means to connect with others using email and other mobile applications (Kuss & Griffiths, 2017). Social networking is mainly dedicated to connecting people through social media. Social media raises Web 2.0 capabilities of creating, distributing and cooperating content online (Giunchiglia et al., 2018). Engaging in a social network encompasses a specific group of social media use.

Social media groups are described by (Kuss et al., 2017) as an online platform to build social relations with other people. Instant messaging and online chats offer real-time text exchange over the internet, e.g., WhatsApp, Facebook, Instagram and Web browser to retrieve, present, and traverse information on the internet e.g., Chrome. Numerous mobile phone dealers have introduced mobile phones with applications such as Facebook, Instagram and WhatsApp that can be installed on smartphones for quick and easy access to chat.

According to Ngesi et al. (2018), the use and adoption of smartphones are developing rapidly in South Africa. Thus, smartphones have proven to be part of our daily lives. Consequently, students' usage of smartphones is seen in various aspects of their lives. This ranges from managing personal information, taking notes, researching information and managing their diaries (Yu & Avgoustos, 2018). Smartphone users consume numerous forms of online content that offer instant happiness by developing social relationships, passing time, and dealing with moods (Mahsud et al., 2020; Fu et al., 2021).

The distinction between the present smartphone and the preceding one is that the previous smartphone was a useful tool in the company, but the cost was too expensive for the community end-users (Rambitan, 2015:243). Smartphones in schools are rarely used for learning purposes even though many students own the device. Therefore, it is crucial to examine the use of smartphones by students. This study focuses on the effects of smartphone use on high school students, as suggested by Rambitan (2015), who states that "the use of smartphones in and out of the classroom" should be investigated.

2.3 Why smartphones for learners?

Smartphones have all the features of mobile learning, including: "ubiquitous, blended, portable, private, interactive", collaboration and current information, as listed by (Ali et al., 2019:58; Bower, 2017:263). Over the years, teaching and learning spaces have changed due to the availability and affordance of new technology (Pratama, 2020). Smartphones are private. This means that mobile phones offer personalised connectivity and increase joint efforts with a real-time synergy that leads to better learning (Robayo-Pinzon et al., 2021; Sharma et al., 2021).

Learners can interact with each other using their smartphones. A smartphone is a mobile device that is smaller, lighter than laptops and computers, and some use a stylus pen to write (Liu et al., 2020). The stylus pen is more natural than a keyboard and a mouse (Nanjandu & Bao, 2017:163). When using a smartphone, Learners can share online assignments and notes without limits. Learners can exchange offline information with the use of Bluetooth and share it. A smartphone is useful everywhere and anywhere, at home, on the train, on the bus and in hotels.

Smart technologies engage learners through games. According to Pratama (2020), smartphone technologies may also contribute to bridging the digital divide and connect the gap between literature, theory and reality. The induction of technology at junior levels is essential and becomes useful when students are exposed to technology at universities and in the workplace.

2.4 Advantages and disadvantages of smartphones

Using a smartphone has many limitations, some of which are explained in this section. The smartphone screen has parameters that limit the amount and kind of information that can be shown, smartphone batteries have to be charged regularly, they might have a slow internet connection, and internet connection is costly (Akyina, Manu & Dzamesi, 2019; Açıkgül & Şad, 2021).

Some of the facts that lead to smartphone rejection at schools are a lack of technical support from faculty members for using smartphones (Iqbal & Bhatti, 2020), lack of maintenance, lack of protection and confidentiality of leaner information (Latif et al., 2019). And the absence of infrastructure to run the portable devices, teachers' attitudes, and lack of digitally competent teachers limit the use of smartphones at schools (Chisango et al., 2020; Ruxwana, Msibi & Mahlangu, 2018).

All of these limitations lead educators not to trust their ability to use smartphones to deliver quality content to students (Hadad et al., 2020; Açıkgül & Şad, 2021). The smartphone market is rapidly changing without warning because smartphones have become outdated forcing users to upgrade so often. Naidu et al. (2021) explain that the absence of a general operating system and general hardware platforms presents a challenge for developers of smartphones to develop content for all. Generally there is no universal operating system (Bauer, Ngo & Resch, 2020), but with the use of HTML5, the developers can create learning content for all kinds of mobile systems.

Smartphones have mobile operating systems such as Windows Mobile or Android, making them more powerful to perform personal computer activities such as scanning, saving documents and sending emails. A mobile operating system is defined as software that permits smartphones, tablets, PCs and other systems to run applications and programs (Nethralaya, 2018). Rashid et al. (2019) define a mobile operating system as the set of systems that control a smartphone, tablet, personal digital assistants (PDAs), or other mobile devices.

Table 2.1 presents the different types of operating systems deployed by various smartphone manufacturers (Turban et al., 2017; Singh et al., 2018; Al-Turjman, 2019; Nel & Boshoff, 2017).

One of the features of smartphones is the small computer programs called apps (Dogruel, Joeckel & Bowman, 2015). According to Dictionary.com (2015), an app is described as an application program that is usually small and is downloaded onto a smartphone. Mobile apps essentially fall into three classifications: web-based, native and hybrid (Biørn-Hansen et al., 2017).

Native apps reside on the smartphone and are retrieved via the icons on the home screen. The native apps “run on a device’s operating system and are required to be adapted for different devices” (Turban et al., 2017; Al-Turjman, 2019). Native apps are downloaded from an online application store. They are developed precisely for one platform and can obtain all benefits of the device characteristics (Huynh & Truong, 2017; Nel & Boshoff, 2017). They can utilise mobile device functions such as the camera, microphone, GPS, list of contacts, among others. The main challenge is that any change in the operating system or hardware renders the apps incompatible (Huynh et al., 2017).

Table 2.1: Common operating system

Name	Developer	Year	Brief Description
Palm OS	Palm Inc	1996	Designed to work for Personal Digital Assistant and touchscreen use. It is used by companies such as Lenovo, Kyocera and IBM.
Blackberry OS	Research in Motion	1999	It is a closed source, not available to other manufacturers. It operates on these smartphones: Blackberry Bold, Blackberry Curve, Blackberry Torch, and BlackBerry 8520. The licence is proprietary and uses Java.
Apple iOS	Apple	2007	Available to Apple only. iOS has been used in iPhones (1-5), iPhone Sc, iPhone Sc 5, iPad (0-4), Objective-C. The licence is proprietary.
Symbian OS	Currently owned by Nokia (Accenture)	2000	Designed for the Nokia series. Open source, licensed by Eclipse public licence, is written in C++ language.
Android OS	Released by Google	2008	It is free and open-source. Used by Samsung, Motorola, HTC. Java and Apache License.
Bada	Samsung	2012	Used on Samsung Wave 1-3.

Web-based apps need a web browser on a mobile device to function; this app supports different devices and is not platform-dependent (Huynh et al., 2017). Web apps look like native applications, but they run via a browser and are scripted in HTML5. End-users manage web browsers in the same way that they would retrieve any web page;

they navigate through a specific Uniform Resource Locator (URL) and then have the option of installing web apps on their home screen and creating a logo for that web app (Ma et al., 2018). Examples of web apps are Google Chrome and Mozilla Firefox.

Hybrid apps are a combination of web apps and native apps (Huynh & Truong, 2017). Since hybrid apps reside on the device and depend on the hypertext markup language (HTML) being provided for in the browser, they benefit from the characteristics of many of the devices.

Native apps work best when offline, have high speed, and the user interface is consistent, but the development is expensive because inventors have to rewrite the same native app for different platforms (Huynh & Ghimire, 2017). Web-based apps are easy to discover, and maintenance is simple even though the visual graphics may not be the same as the user is accustomed (Biørn-Hansen et al., 2017). Smartphone users use these apps to access web services and for educational purposes, especially when learning is done by design (Pratama, 2020).

2.5 Learning with smartphones

Before the mobile phone age, students had other ways of communication, such as sending letters and visiting each other. Modes of communication changed when mobile phones were introduced, and so has the process of attaining knowledge. Through the procedure of mobile learning, students learn through words, pictures, sound, animations, and images, all provided by mobile devices. Compared with traditional teaching, regular web-based learning or mobile learning situations might be far more difficult for learners as they are required to balance learning material in both the digital world and traditional learning (Chu et al., 2017).

Previous studies investigated how mobile technology can increase learner productivity through projects such as the Bring Your Own Device (BYOD) project and One Laptop Per Child (Ale, Loh & Chib, 2017). BYOD is defined by Ruxwana, Msibi and Mahlangu (2018) as the policy or practice whereby learners and teachers bring their mobile device for the purpose of learning. OLPC is a project formed by non-profit organisations to develop education through technology by providing each learner with a low-cost laptop (Leslie, Steeves & Kwami, 2017).

The study was focused on the effects of smartphone use on high school students. It is not limited to the classroom, but it is centralised on smartphones in the classroom and outside the school (Ma et al., 2018), without any instruction from the teacher or any guardian. Ng et al. (2020) analysed that student success increases significantly when learners utilise mobile learning devices such as smartphones in the classroom for educational purposes.

2.6 Use of smartphones in high school

According to Apgar (2020), on average, learners spend fewer hours reading, more of their hours playing video games, chatting on social media and even more of their hours watching television. In the past, learners used notebooks, pencils, course notes and study guides to study and seek information. Nowadays, learners seek and access information online using mobile technologies such as smartphones. Mobile technology has also changed the way people do everyday duties like learning, shopping, communicating, and banking. The use of smartphones has brought more opportunities and challenges, especially for high school learners. There are, however, countless issues that impact the use of smartphones.

2.6.1 Factors that affect learning with smartphones

Yu et al. (2018) and Lock et al. (2021) listed several factors that affect students who learn with smartphones: affordability, accessibility, internet access, support from parents and educators, and recognition of informal learning. Other factors that also affect learning with smartphones, such as “user-friendly design; technical competency; learner community development; learners’ perceptions; possession; the choice of mobile devices and cross-platform capability”, are listed by Alrasheedi and Capretz (2014).

2.6.2 Opportunities for learning with smartphones

A smartphone is a portable and always available device that fits in the hand, is light weight and is easy to carry around (Iqbal & Bhatti, 2020; Chatterjee et al., 2020). Hezili (2018) mentioned that learners are good at using mobile technologies out of the schoolyard, and therefore, they can use similar expertise in the classroom to do their schoolwork successfully. Regardless of the rising disapproval of mobile phone use by teachers, many studies state that the use of mobile phones can make learning occur at any time without location constraints (Yu & Avgoustos, 2018) and provide access to educational content (Robayo-Pinzon et al., 2021).

A smartphone offers different websites that enhance the eagerness of learners to learn and increase learning in a more stress-free and pleasant manner (Rambitan, 2015:244). Mahsud et al. (2020) discovered that learners who use their smartphones to take notes in more comprehensive information; they can remember detailed knowledge from lectures, so they obtain higher scores during tests. In contrast, Abbas et al. (2020) argue that texting in the classroom could delay learners from successfully

processing information in temporary memory and saving that information into long-term memory to use later.

Schools are challenged to groom learners for positions in the worldwide, knowledge-work economy by assisting them to advance in 21st-century expertise, such as critical thinking, problem-resolving expertise, invention and innovation skills, learning through self-discipline, and collective learning with a smartphone as an essential tool (Gqontshi, 2019).

Smartphones enable learners to retrieve information at any time. This encourages learners to be accountable and learn at their learning speed (Annamalai & Kumar, 2020). Abbas et al. (2020) and Naddeo et al. (2021) expressed that smartphones allow learners to find and use their learning methods, study as a team, and generate and share information. Despite all available opportunities, there are still challenges with students using smartphones.

2.6.3 Challenges of learning with smartphones

The main challenge of learning with smartphones is texting because it can lead to cheating and cyberbullying. With the increased familiarity of smartphones among the youth, there is an increased reservation among adults about the unpleasant effects of mobile phones. Some school policymakers have searched for a standard policy to regulate mobile phones among all learners.

2.6.3.1 Cheating

While some teachers consider the use of a smartphone as a potential educational tool for teaching and learning online (Nikolopoulou et al., 2021), many school administrators only see them as interruptions to learning, mainly since they present

possible disturbances through their vibrations or ring tones, notifications, texting, tweeting and cheating (Kuss & Griffiths, 2017; Abbas et al., 2020).

The habit of cheating and plagiarism has always not made it easy for teachers to support smartphones at school. Principals and teachers have been managing cheating for ages; it can be declared an enormous challenge and is an age-old problem (Yu & Avgoustos, 2018). In addition, harmful impacts such as lack of focus in the classroom, immoral behaviour such as cheating, theft and bullying are a disadvantage of smartphone usage in the classroom (Abbas et al., 2020; Yu et al., 2018).

Giunchiglia et al. (2018) indicate that the most harmful influence of smartphones in education is sending short messages to exchange solutions in the classroom.

2.6.3.2 Texting

Turban et al. (2017) define text messaging as the exercise through which users of smartphones interchange short written messages through mobile networks. The action of sending messages is named texting, and the sender is named the texter. Songxaba and Sincuba (2019) and Apgar (2020) have studied the impact of a simple message system on different aspects of social life based on academic work. Ngesi et al. (2018) report that more students and lecturers agree that short messaging can harm their writing skills.

Addiction to smartphone usage can be a problem in society. Social networking can be created by making a call, sending a text message, or exchanging pictures and videos. With smartphones, a user can have instant communication with other people through different channels such as videoconferencing and Skype. These days people use their smartphones for many different tasks, from sending text messages to playing

games, becoming addicted to their phones (Kuss & Griffiths, 2017). Students with access to a smartphone are most prone to addiction and distraction in the learning process (Mahsud et al., 2020).

2.6.3.3 Addiction

The addiction to technology is a severe problem for adolescent students. Smartphone obsession is another form of addiction. Jin Jeong, Suh and Gweon (2020) describe smartphone obsession as “characterised by excessive use of smartphone” e.g., the desire to be in continual communication with persons even though there is no actual communication. Mobile phone obsession is a challenging behaviour, and other researchers called it problematic smartphone use (Park, Jeong & Rho, 2021). The most common example of smartphone use challenges is in legally controlled areas such as banks and libraries.

Smartphone obsession is a critical predictor of the desire to use and in the buying of smartphones. Some of the concerns resulting from mobile device obsession comprise managing time and academic problems in school (Kuss et al., 2017). In most cases, the challenge is not in the usage of the smartphone; yet, it begins when the device undertakes the complete role of the human brain, like in doing simple calculations (Yu et al., 2018). Security issues and cyberbullying are concerns in accepting smartphones in high schools.

2.6.3.4 Security issues

The fact that smartphones are restricted in processing functions means they need various attributes like encryption methods, “multi-tier authentication, real-time PIN generation and assurance of secure transactions by sending confirmation code” in

case of any suspicious scams, these encryption methods can be valuable (Mahapatra, 2017:941). Even though communication between the mobile phone and the service provider's transmission equipment can be encrypted for privacy with end-to-end encryption, wireless internet sessions are as vulnerable as other decrypted communications over the Internet (Yoo et al., 2021). Using the Internet leaves tracks through cookies. Cookies are a method that stores browsing history and enables access to information stored by authorised third parties that produce threads to data privacy (Korac, Damjanovic & Simic, 2020).

2.6.3.5 Cyberbullying

Smart technology not only creates advantages but also causses pain to victims of cyberbullying. Cyberbullying is defined as repeated harmful intended action through the usage of various "electronic media such as social networks, chat rooms, emails and cell phones, through which intimidating and aggressive messages are sent and received" (Watts et al., 2017:269).

Cyberbullying is a violent utilisation of the Internet towards anyone who cannot defend themselves from any form of bullying. The main threat is that cyberbullying spreads to a broader audience at speed, beyond the limitations of time, personal and physical space (Negi & Magre, 2018). South Africa is making progress in addressing cyberbullying, thus the Cybercrimes Act 19 of 2020 is in place to guide citizens. A study is conducted on how to deal with e-safety education and awareness in the country (Kritzinger, Loock & Mwim, 2018).

2.7 Conclusion

This chapter discussed the literature review of smartphones, their evolution, disadvantages, and advantages of smartphones, learning with smartphones, the use of smartphones in high school, and opportunities and challenges of learning with smartphones. The next chapter deliberates on the conceptual framework adopted in this study.

CHAPTER 3: THEORETICAL FRAMEWORK ADAPTED IN THE STUDY

3.1 Introduction

The preceding chapter discussed the review of literature for smartphones. The following topics were discussed: the evolution of smartphones, the advantages and disadvantages of learning with smartphones, the use of smartphones and the factors affecting students learning with smartphones. This chapter presents the theories and models used to understand individuals' beliefs, as well as the use and acceptance of technology.

3.2 Theoretical framework

There are numerous theories on the acceptance of technology and its use that have provided a considerable understanding of the adoption and application of Information Communication Technology (ICT). These theories evaluate the effect of the attributes of technology based on the attitudes and behaviour of individuals and their beliefs in adopting a new ICT (McKerlich, Ives & McGreal, 2013).

The Technology Acceptance Model (TAM) was suggested by Davis (1989), cited by Arora and Sandu (2018), to predict user adoption of information systems. TAM was constructed from the Theory of Reasoned Action (TRA). Dlodlo and Mafini (2013) clarify that “TAM revolves around the attitudinal definitions of the intention to use technology” and explain that “TAM has two attitudinal” aspects: Perceived Ease Of Use (PEOU) and Perceived Usefulness (PU). Dlodlo and Mafini (2013) also mention that, according to TAM, these two factors function as the origin for “attitudes towards using” a specific system, “which in turn decides the intent to use and then creates the

genuine usage behaviour" (Lu et al., 2003:207). PEOU is explained as "the extent to which a user trusts that utilising a certain system will be free of effort" (Davis 1989:320; Spreer & Rauschnabel, 2016). PU is explained as "the extent to which a user trusts that using a certain system would improve his or her job execution" (Davis, 1989:320; Lu et al., 2003).

An important objective of TAM is to offer a base for determining "the influence of external factors on internal beliefs, attitudes and intentions" (Venkatesh et al., 2003:985, cited by Lu et al., 2003; Bopape, 2008). However, the main restriction of TAM is its lack of ability to reveal the determinants of PEOU and PE variables (Bagozzi, 2007a; Bopape 2008).

The Theory of Planned Behaviour (TPB) was constructed by Ajzen (1991). Compared to TAM, TPB focuses on "specific settings and external" elements that affect the adoption of technology (Lu et al., 2003:207). In addition, Lu et al. (2003:207) focus on "attitudes towards use, subjective norms, and perceived behavioural control such as skills, opportunities, and resources needed to use the system to influence behaviour". TPB is highly suitable for conditions in which users do not have full control of what they are supposed to do. Lu et al. (2003) further explain that "this model integrates additional factors that do not exist in TAM but are significant to determinants of behaviour".

The original TAM was modified by Venkatesh and Davis (2000) with the addition of constructs determining PEOU and PE in association with social and cognitive processes. The constructs of the additional social factors to the model are voluntariness, the subjective norm and image. The cognitive process factors are output quality, job relevance and experience. The model was tested with willing

participants in a prescribed setting by Venkatesh and Davis (2000) and performed exceptionally well in both situations.

Due to the growing information technology industry, numerous attempts were made to develop and propose multiple models that aid in envisioning and explaining the reception and utilisation of different technologies (Venkatesh et al., 2003). Investigators continue to study and construct more effective models that combine “both human and social variables”, and this led to the construction of the Unified Theory of Acceptance and Usability of Technology (UTAUT) model (Venkatesh et al*.,* 2003:429; Oye, Iahad & Rahim, 2014:256).

UTAUT was constructed by Venkatesh et al. (2003) to identify important factors in the implementation of ICT “as measured by behavioural intention to use technology and actual usage”, grounded on ideal and factual resemblance (Oye, Iahad & Rahim, 2014:256). The Unified Model was created across eight models listed by Kasim, Yaacob and Malim (2013:335): Theory of Reasoned Action (TRA); Motivational Model (MM); Technology Acceptance Model (TAM); Combined Theory of Planned Behaviour and Technology Acceptance (C-TPB-TA); Theory of Planned Behaviour (TPB); Innovation Diffusion Theory (IDT); Model of Personal Computer Utilisation (MPCU); and Social Cognitive Theory (SCT).

UTAUT integrates 32 determinants originating from the “eight models into four main determinant factors and four moderating factors” (Oye, Iahad & Rahim, 2014:256). The new factors are effort, performance, and social facilitating conditions, together with four mediators, experience, age and gender, and voluntariness of use (Khechine, Pascot & Bytha, 2014:39).

UTAUT uses behaviour intention like TRA and TAM to predict and explain system behaviour usage. In their research, Venkatesh et al. (2003) indicate that the PU factor from TAM was integrated into performance expectancy and PEOU into effort expectancy. The subject norm determinant was integrated into the social influence factor, and the facilitating condition was used as a new factor. Venkatesh et al. (2003) explain the new determinants as follows:

1. **Performance Expectancy (PE)** is explained as the extent to which users trust that "using a system enables him/her to do the work" (Venkatesh et al., 2003:447; Arora et al., 2018:27).
2. **Effort Expectancy (EE)** relates to "the easiness associated with the use of the system" (Venkatesh et al., 2003:450).
3. **Social Influence (SI)** is described as the individual perception "that important people believe that he or she should use the system" (Venkatesh et al., 2003:452).
4. **Facilitating Conditions (FC)** refer to the user's "observation of the several resources and existence of support to perform chosen behaviour" (Venkatesh et al., 2003:453, cited by Chopdar & Sivakumar, 2019).
5. **Hedonic Motivation (HM)** refers to "the fun or pleasure derived from using technology" (Venkatesh et al., 2012:161).
6. **Price Value (PV)** is defined as the "consumers' cognitive trade-off between the perceived benefits of the application and the monetary cost for using mobile systems" (Dodds et al., 1991:308; Venkatesh et al., 2012:161).
7. **Habit (H)** is defined as "the degree to which users tend to fulfil behaviours automatically because of learning" (Limayem, Hirt & Cheung, 2007:709).

8. Page 28 “**Behavioral Intention (BI)** refers to the motivational reasons that influence a certain behaviour where the stronger the intention to perform the behaviour, the more likely the behaviour will be performed” (LaMorte, 2019).

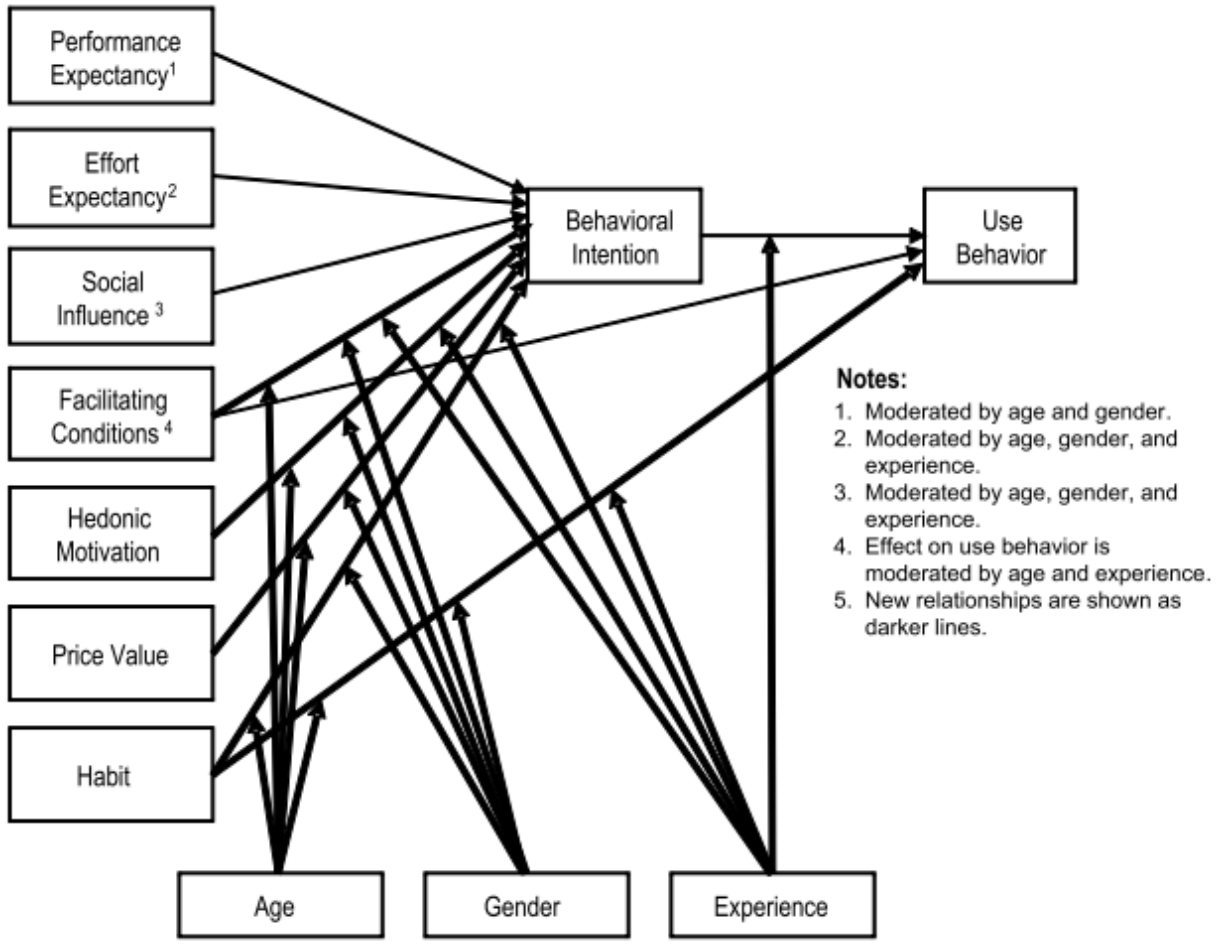

Figure 3.1: Unified Theory of Acceptance and Use of Technology 2

Venkatesh et al. (2012) examined previous studies, such as articles, journals, and conference proceedings (Bagozzi, 2007b; Venkatesh, Davis & Morris, 2007; Xu, Ma & See-To, 2010). They found that none of them extended UTAUT. They also discovered that some work has been done to further UTAUT, but that the work done only studied some subsets of the UTAUT construct. Venkatesh et al. (2012) approached the extending of a new model by introducing these constructs: “price value, hedonic motivation and habit” to form the second Unified Theory of Acceptance

and Use of Technology (UTAUT2). UTAUT2 is used to understand consumers receiving and utilising information technology.

In the study, the price value was not assessed for when Venkatesh introduced the price construct in 2012, the focus was on the consumer perspectives to adoption and use of technology. The price construct is associated with the value that a consumer is getting out of the technology, while the student ‘s value is associated with the knowledge gained. In an educational setting cost of the technology used is carried by the institute (Tamilmani et al., 2018). Students will invest time and effort to gain knowledge from smartphones once adopted in schools.

3.3 Operationalising the research model

The study aims to investigate the intention of high school students to use smartphones at school and the effect it has on their performance using UTAUT2. The TAM was used in education to establish the acceptance and use of technologies in different educational environments. In this study, UTAUT2 by Venkatesh et al. (2012) was used to examine reasons that affect the usage of smartphones by high school students. UTAUT2 was chosen because the model was recognised to provide an enhanced explanation of the intention to use technology other than common models like TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003).

In their research, (Venkatesh et al., 2012) identified the gap in consumer acceptance and technology when UTAUT2 was derived. When UTAUT2 was incorporated, voluntariness was removed from the set of moderators of UTAUT, and a facilitating conditions factor was connected to “behavioural intention and moderated by gender, age and experience” (Venkatesh et al., 2012).

Voluntariness was removed, and Venkatesh et al. (2012) explain that “consumers have no organisational mandate and thus, most consumers’ behaviour is completely voluntary”. This model fits in very well with the study because the study is based on smartphones adoption and use by high school students. These students have no organisational mandate to fulfil, other than their personal goals. The UTAUT2 incorporated these new constructs: “price value, hedonic motivation and habit”. These factors play a significant role in the usage of new technologies by consumers (Venkatesh et al., 2012:457).

Hedonic motivation is well-defined by Venkatesh et al. (2012) as “the fun or pleasure derived from using a technology”. Experience is conceptualised by Venkatesh et al. (2003) as the “chance to use a target technology and is usually operated as the passage of time from the original use of a technology by an individual”. Habit is described as “the degree to which users tend to fulfil behaviours automatically because of learning” (Limayem et al., 2007:709).

The smartphone is the system that is tested in this study. The key dependent variable is the behavioural intention to use a smartphone. Khechine, Pascott and Blytha (2014:38) state: “intentions are assumed to be motivational factors that influence behaviour.” They are signs of how users are eager to try and “how much of an effort they are planning to exert in order to perform a behaviour” (Khechine, Pascott & Blytha, 2014:38). The variable tested in the study (Bopape, 2008) is the use of smartphones.

3.4 Formation of the hypothesis

Based on the literature, the hypothesis construct from Figure 3.1 is proposed. The model is adapted from Venkatesh et al. (2012). The conceptualised model for the study is displayed in Figure 3.2.

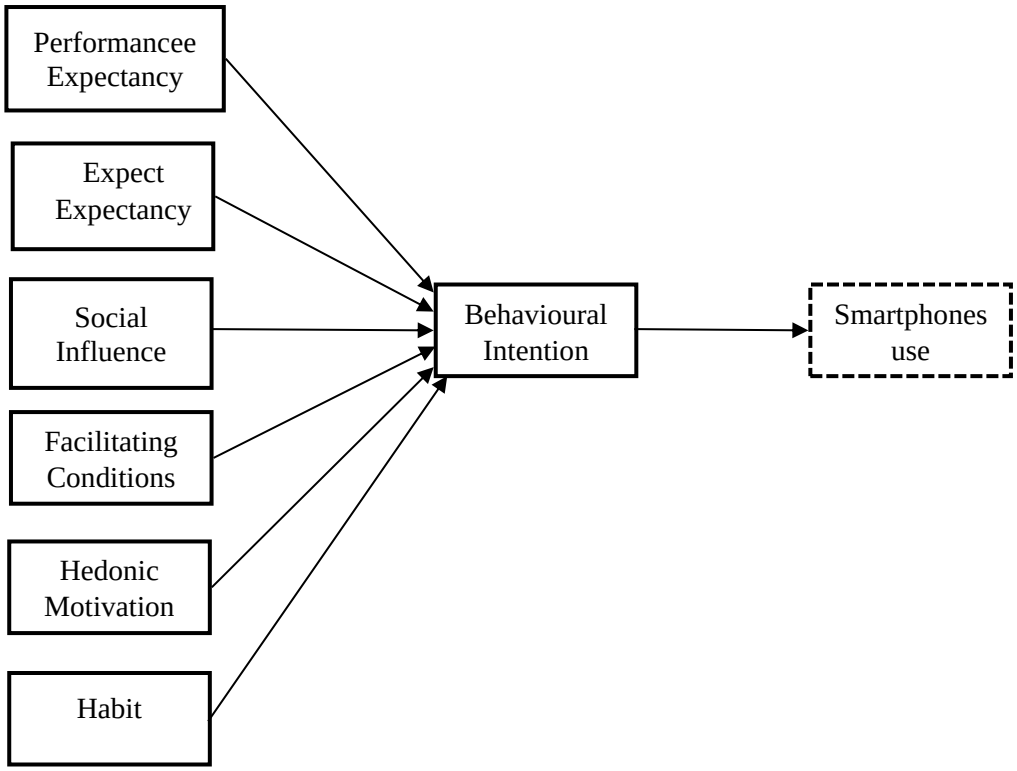

Figure 3.2: Conceptualised model to study use of smartphones

Performance Expectancy (PE) was proven to be "the influential predictor of behavioural intention" (Venkatesh et al., 2003). PE is the extent to which smartphones are expected to help learners improve their academic performance. The hypothesis PE determines whether the "behavioural intention to use" a smartphone impacts the learners' performance (Rad et al., 2019). The answer to these questions also refutes the opinion from previous literature that smartphones are a form of destruction rather than of learning (Maphalala & Nzama, 2014; Mavhunga et al., 2016). In the context of learning, PE refers to learners using a smartphone to do schoolwork, and in turn, using smartphones should help them improve their marks.

H_1: PE influences the intention of learners to use smartphones.

Effort Expectancy (EE) refers to the ease of using the system. Smartphones are friendly and easy to use. It is believed that this motivates students to use them. Here, the focus is on the usability of their phones

H_2: EE encourages the learners' BI to use smartphones.

SI is explained as the learners' perception "that important people believe that he/she should use the system" (Venkatesh et al., 2003:452; Venkatesh et al., 2012:187). In the study, important people who influence learners to use smartphones are friends and parents.

H_3: SI influences the learners to use smartphones.

Facilitating Conditions (FC) are the learners' perception "of the resources and existence of support available" to use a smartphone (Venkatesh et al., 2012). In this study, learners use their smartphones with support from their parents or guardians and friends. The study investigates the conditions that make it easy for learners to use their phones. Resource and available support refer to learners having access to Wi-Fi, data and airtime.

H_4: FC influences learners to use smartphones.

Hedonic Motivation (HM) refers to "the fun or pleasure obtained from using technology" (Venkatesh et al., 2012:161). HM affects "behavioural intention towards adopting technology" (Lewis et al., 2013:30). Rambitan (2015) reveals that students are more willing to learn in a relaxed and enjoyable way. The hedonic motivation hypothesis tests that, use of a smartphone to do schoolwork is entertaining, fun, and enjoyable; therefore the hypotheses will be:

H_5: HM influences learners' intentions to use smartphones.

Salehan and Negahban (2013) discovered that mobile phone obsession is challenging. This study examines customary ways in which learners adapt and use their smartphones. The assumption is that learners developed the habit of using their smartphones anywhere and anytime. Habit is defined in the context of technology as "the degree to which persons tend to carry out behaviours inevitably because of learning" (Limayen et al*.,* 2007:709, cited by Venkatesh et al., 2012:161; Lewis et al., 2013:26).

H_6: Habit influences the learner's intention to use of smartphones.

Behavioural Intention (BI) is "the extent to which a person has formulated conscious plans to perform or not to perform some specified behaviour" (Venkatesh et al*.*, 2012:162, cited by Yaokumah & Amponsah, 2017). BI is the key factor of technology acceptance, according to Venkatesh et al. (2012). EE, PE, FC, SI, HT and HM are antecedents of BI.

Mobile phone usage was established as an important predictor of intent towards smartphone usage (Salehan & Negahban, 2013). The study investigates how learners are planning or willing to use their smartphones. The three determinants FC, HT, and BI, are directly related to BI. The hypothesis will be:

BI_7: Behaviour Intention influence learners to use smartphones.

3.5 Conclusion

In this chapter, the theoretical framework of UTAUT2 was deliberated upon in terms of learners' perceptions of smartphone use. The UTAUT2 model has been adopted in

the study to examine the effects of smartphones on high school learners' performance. The PV construct was dropped. A study conducted by ICASA indicates that in South Africa, the use of smartphones was 91.2% in 2019, which was higher than in previous years (Mzekandaba, 2020), and many South Africans have more than one smartphone (Gilbert, 2019).

Statista (2020) discovered that about twenty to twenty-two million people in South Africa use a smartphone, and the number of smartphone users is estimated to grow by more than five million in 2023. However, the study is based on the knowledge to be gained by students, not necessarily purchasing a smartphone. It is suggested that the study will not be based on the pricing of the smartphone.

The price construct is associated with the benefits that a consumer gets from the technology, while the student's value is associated with the knowledge gained. In an educational setting, the institute carries the cost of the technology used. Students will invest time and effort to gain knowledge from the system, which applies to smartphone use if adopted in schools.

The following chapter deliberates on the research approach used for the study.

CHAPTER 4: THE RESEARCH METHODOLOGY

4.1 Introduction

The previous chapter discussed the theoretical framework that was applied for this study. This chapter examines the research objectives and purpose of the research, the methodology, research tools, data, analysis, limitations and ethical concerns.

4.2 Research objectives and the purpose of the research

This study investigates the effects of smartphone use among high school students, its impact on their studies and how the smartphone could be regarded as a tool for instruction and attaining knowledge. The research responds to the following matters:

1. What elements affect the adoption and use of smartphones by learners?
2. What impact does the use of smartphones have on learners' performance?

The purpose of the study is to remodel the framework to fit the use and acceptance of smartphones on high school students' performance.

4.3 Research design

This study is conducted using the positivist approach. Positivist researchers "focus on causality and law-like originations, decreasing phenomena to elementary factors" (Saunders, Lewis & Thornhill, 2009). The researcher proposes and tests theories with data that are highly structured, measurable, and not influenced by the researcher's values. This philosophy includes a large sample or fragment of quantifiable data and statistical proposition testing.

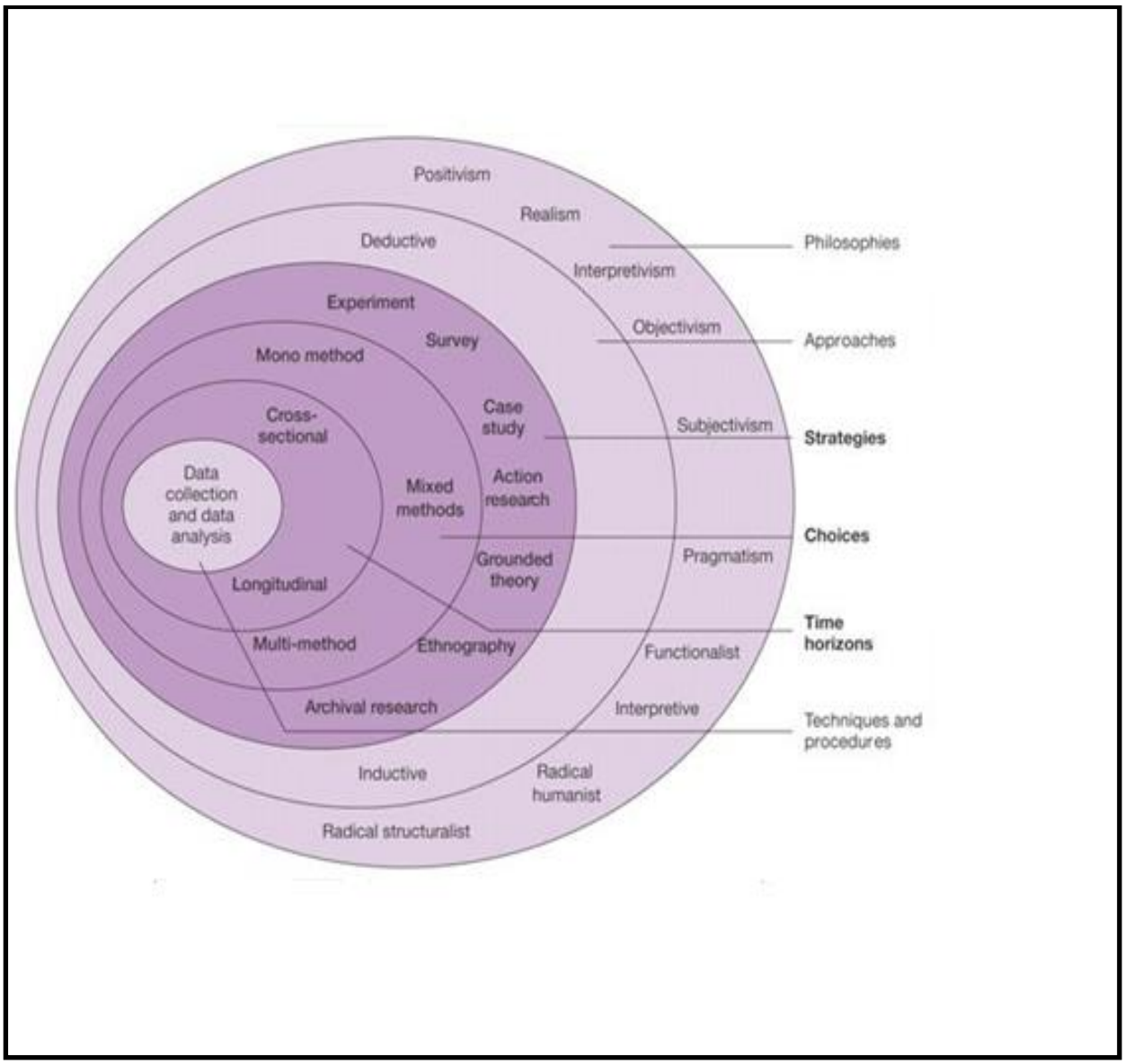

Figure 4.1: The research process onion (Saunders, Lewis and Thornhill, 2009)

The research design process utilised in this study is the “research onion model” established by Saunders, Lewis and Thornhill (2009). The model is depicted in Figure 4.1. The research onion model defines several stages of the “research process which comprises the research philosophy, research approach, research design, data collection methods and analysis methods”. As indicated by Saunders, Lewis and Thornhill. (2009), the research onion is matched to the detaching of the layers of an

onion until it has reached the lowest layer, where the lowest layer is the examination of the upper layers.

Research design is described as an outline for guiding a study with reasons that may affect the legitimacy of discoveries (Burns & Grove, 2003). Research design can be qualitative or quantitative, or both. In a quantitative study, the researcher uses postpositive declarations for generating knowledge, applying a strategy of enquiry "such as experiments and surveys and gathering information that yields statistical data" (Creswell, 2003:18). In this study, the quantitative method is used.

4.3.1 Research strategy

A survey is used to conduct this study. A survey is explained as the "collection of information in an organised, systematic manner around characteristics of interest from some or all parts of a population using well-defined ideas, methods and procedures, and such information is put together in a useful form" (Statistics Canada, 2010). The quantitative survey method is utilised because it is cost-effective and does not take time. In the quantitative method, data is gathered on a tool that assesses attitude, and the information gathered is evaluated "using statistical procedure and hypothesis testing" (Creswell, 2003:20).

4.3.2 Data collection method

The data was gathered in high schools across the Gauteng Province, South Africa. A set of questions was utilised as a research tool to collect data in this study. The data was used to determine the effects of smartphone use among high school students. The researcher mentioned that a set of questions was utilised as a data capture tool and was used to do two things (Gunter, 2000):

1. “It records all the questionnaires a researcher needs to report on”; and
2. “It offers a specific tool for recording the answers”.

Like other methods, questionnaires have advantages and disadvantages.

Advantages of questionnaires

1. The responses are collected in a consistent manner; thus, questionnaires have a purpose,
2. It is quick to collect information using questionnaires and
3. A questionnaire is a cheap and valuable way of gathering data from a large population.

Disadvantage of questionnaires

1. Questionnaires are standardised; hence, it is possible that respondents might misunderstand some questionnaire items. This may be solved by trying out the questionnaire on a smaller set of the population beforehand;
2. Open-ended questions may produce a large amount of data that can be time-consuming to process and analyse; and
3. The participant(s) might not be ready to respond to the questionnaire. The participant(s) might not wish to disclose information that they consider to be sensitive, like their age, or they might feel that their response or opinion might be used against them. Therefore, the researcher had to explain to the participants the purpose of the questionnaire and reassure them that their responses were confidential.

The questionnaire was structured and standardised so that individual responses could be counted up and compared. The questionnaire was hand-delivered to schools and collected the next day or on the date agreed upon.

The questionnaire was used in the study because other researchers have used the instrument before for similar research; that is why it was found to be fitting for the research (Gikas & Grant, 2013; Madden et al., 2013; Nasser, 2014; Rambitan, 2015).

4.3.3 Measurement instrument

The 32-item questionnaire instrument was adopted from the theory of the UTAUT model, as suggested by Venkatesh et al. (2012), to accomplish the objective of the study. The items were adjusted to fit the objective of the research.

A questionnaire was designed to focus on the research questions mainly useful for collecting data. The questionnaire has two sections. The first section has a set of demographic questions (age, gender, experience, grade and race) and the second section has a set of multiple objects that measure key concepts of the research.

The questionnaire measures the following constructs: “performance expectancy, social influence, effort expectancy, hedonic motivation, facilitating conditions, habit, user intention and use behaviour” (Chopdar & Sivakumar, 2019:36; Lewis et al., 2013:24; Bhatiasevi, 2016:800). In the study, the construct was revised so that:

1. **Performance expectancy** measures how much schoolwork the learner can do with the smartphone.
2. **Effort expectancy** studies how easily learners can operate their smartphones to do schoolwork.

3. **Social influence** studies how learners are easily influenced by others to use their phones.
4. **Facilitating condition** studies the availability of resources to support the learners in using their phones.
5. **Hedonic motivation** studies behaviour that motivates learners' intentions to use smartphones.
6. **Habit** studies behaviour that influences learners to constantly use their phones.
7. **Behavioural intentions** to study the intention of a learner to use the phone.

These are closed-ended questions. The questionnaire is designed in such a way that it is easy to understand and to the point. Responses were computed by utilising a five-point Likert scale. The five-point Likert scale is much easier to apply; therefore, learners will not spend too much time responding to the questionnaire. Furthermore, the data collected was easy to interpret.

The constructs were calculated on a five-point Likert scale ranging from 1 to 5, where 1=strongly disagree, 2=disagree, 3=neutral (neither disagree nor agree), 4=agree, and 5=strongly agree. The constructs: *performance expectancy* (PE), *effort expectancy* (EE), *facilitating conditions* (FC), *hedonic motivation* (HM), *habit* (H), and *use of a smartphone* have four items, while the constructs *social influence* (SI) and *behavioural intention* (BI) have three items. Table 4.1 represents the constructs and the instrument measurement items.

4.3.4 Population

Only high school students across the Gauteng Province took part in the study. Convenient sampling was used to choose the schools to take part in the study. The schools were selected because they were part of one tablet per student project rolled

out by the Gauteng Department of Education in 2015. Purposive sampling was adopted to identify students:

1. Who are in possession of personal smartphones
2. The provisions of phones are supplied by the school.

Then voluntary sampling was then applied to groups 1 and 2. Students were informed that they were not forced to participate in the study; only those who were willing could participate.

Quantitative data was gathered from Grade 8 to Grade 12 to represent all the grades and so that the sample can be generalised to a larger population. The age distribution was between 12 and 25 years. Because of cost and time limitations, the research was done in Gauteng Province, Ekurhuleni region, Tembisa.

All respondents were provided with an agreement form to sign. For learners under 18 years of age, two agreement forms were given to fill in. The first consent form was signed by the learner's parent or guardian , and the learner filled in the second form.

Participation in this research was voluntary; all gathered data was handled in the strictest confidence, and no learner or school was identifiable in any of the reports. The printout of answers was scanned and stored on a password-protected computer. They will be kept for a minimum of five years and can be used for future academic work.

Table 4.1: The constructs and instrument measurement items

Performance Expectancy (PE)
I find using my phone very helpful for my school work.
Using my phone always helps me in getting my schoolwork done.
Using my phone helps to improve my schoolwork.
Using my phone helps in increasing my marks.
Effort Expectancy (EE)
Using my phone helps me to understand my schoolwork.
Using my phone helps me to do more schoolwork.
It is easy for me to do my schoolwork using my phone.
My phone is easy to operate.
Social Influence (SI)
My friends help me to understand how to use my phone.
My parents help me to understand how to use my phone.
I use my phone in doing my schoolwork because I saw my friends using their phones to do schoolwork.
Facilitating Conditions (FC)
I always have airtime on my phone.
I always have data on my phone when I am at school.
I always have data on my phone when I am at home.
I always have access to free data.
Hedonic Motivation (HM)
Using my phone for schoolwork is fun.
Using my phone for schoolwork is enjoyable.
Using my phone for schoolwork is entertaining.
I derive pleasure from using my phone for my schoolwork.
Habit (H)
I use my phone in and out of the classroom.
I use my phone everywhere I go.
I always use my phone for my schoolwork.
I may not use my phone for my schoolwork.
Behavioural Intention (BI)
I will continue using my phone in future for my schoolwork.
I will always use my phone when doing my schoolwork.
I will continue to use my phone frequently in and out of the classroom.
Use of a smartphone
How often do you use your phone to call your friends?
How often do you use SMS to talk to your friends?
How often do you use Facebook to talk to your friends?
How often do you use WhatsApp to talk to your friends?

4.3.5 Analysis

The data gathered from the questionnaire was processed utilizing the Statistical Package for the Social Sciences (SPSS). SPSS is a statistical package that was developed in 1968 with the goal of using statistics to drive decision-making information in the social sciences (Hashemi, 2007). SPSS contains a collection of software tools for data recording, data organisation, statistical analysis and reporting.

The Partial Least Square (PLS) method, a statistical analysis technique based on Structural Equation Model (SEM), was used to test and validate the proposed model. In the study, descriptive statistics were used to calculate the frequency and percentage of the participants' demographic information in SPSS version 23.0. The data from questionnaires were captured into Microsoft excel and imported to SPSS.

4.3.6 Limitations

Because of limited funds and time, the study was done in Gauteng, in the Ekurhuleni region only. Only high school learners contributed to the study. After school hours, the study was done at secondary schools to avoid disturbance. The learners were given the questionnaire and two consent forms to fill in. The questionnaire was collected the following day. The first consent form was signed by the parent or guardian of a learner, and the learner filled in the second form.

4.5 Ethical considerations

To adhere to ethical concerns, permission to conduct the research was requested from the UNISA School of Computing, Department of Education, Ekurhuleni region and from the principals of the schools that participated in the study.

4.6 Conclusion

This chapter has rationalised the reason and objectives of the research and the research methodology. The population was also covered, the instrument used to gather the data was thoroughly explained, as were the limitations and ethical considerations. In Chapter 5, the demographic data is presented, analysed, and the findings are discussed.

CHAPTER 5: PRESENTATION ANALYSIS AND OF DATA

5.1 Introduction

The previous chapter discussed the research aims and the reason for the research, the research design and research strategy, the data collection method, the population, and limitations and ethical clearance. This chapter has two sections. Section A reports on the demographic outcome and analysis. The outcomes of quantitative findings come from thirty questionnaires completed by high school learners from three high schools in Tembisa, in the Ekurhuleni district. The analysis of the outcomes was computed with SPSS 23.0. A total of two-hundred and fifty-nine respondents took part in the survey questionnairebased on two sections.

5.2 Section A: Demographic data presentation

This section focuses on demographic data presentation. The data presents the averages of schools that participated with reference to age, gender, race and years of experience in using smartphones.

Only three schools participated in the research. To protect the schools' identities, the schools were named School A, School B and School C. The school's management and learners agreed to participate in the research. All learners under eighteen years of age were granted permission by their parents to participate .

The demographic representation of all grades is presented in Table 5.1 and analysed below.

Table 5.1: Demographic information

School	**Frequency**	**percent**	**Valid percent**	**Cumulative percent**
A	107	41.3	41.3	41.3
B	78	30.1	30.1	71.4
C	74	28.6	28.6	100.0
Total	259	100.0	100.0	
Age	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
12-16yrs	93	35.9	35.9	35.9
17-19yrs	153	59.1	59.1	95.0
20-22yrs	10	3.9	3.9	98.8
23-25yrs	3	1.2	1.2	100.0
Total	259	100.0	100.0	
Gender	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Male	104	40.2	40.3	40.3
Female	154	59.5	59.7	100.0
Missing	1	0.4		
Total	259	100.0		
Race	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Per cent Percent**
None	4	1.5	1.5	1.5
Black	251	96.9	96.9	98.5
Coloured	4	1.5	1.5	100.0
Total	259	100.0	100.0	
Grade	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Grade 8	57	22.0	22.0	22.0
Grade 9	56	21.6	21.6	43.6
Grade 10	42	16.2	16.2	59.8
Grade 11	59	22.8	22.8	82.6
Grade 12	45	17.4	17.4	100.0
Total	259	100.0	100.0	
Years of Experience	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
0-1yrs	52	20.1	20.2	20.2
1-2yrs	38	14.7	14.7	34.9
2-3yrs	83	32.0	32.2	67.1
3yrs and more	84	32.4	32.6	99.6
None	1	0.4	0.4	100.0
Total	258	99.6	100.0	
Missing	1	0.4		
Total	259	100.0		

The demographic information of the learners who participated in the study comprises age, gender, race, grade and years of experience of using smartphones, as presented in Table 5.1.

Gender

Female respondents have the highest response rate of 59.7%, while male respondents have a low response rate of 40.3%. The missing value represents the learners who did not want to identify their gender.

Age

Learners between twelve and twenty-five years participated in the research. Learners between the ages of seventeen, and nineteen had the highest response rate of 59.1%, followed by learners between the ages of twelve and sixteen years with a response rate of 35.9%. The lowest response of 1.2% was from learners between twenty-three and twenty-five years.

Race

About 96.9% of learners who responded were Blacks, while 1.5% were Coloured and 1.5% did not want their race to be known.

Grade

The highest participation of learners was from Grade 11, with a response rate of 22.8 %, followed by learners from Grade 8 with a response rate of 22.0 5%, and then learners in Grade 9 with a response rate of 21.6%. Learners in Grade 10 had the lowest response rate of 16.2%, followed by learners in Grade 12 with a response rate of 17.4%.

Years of experience

Learners with more experience showed greater interest in the study. The response rate of learners with more than three years' experience was high, with a response rate of 34.4%, followed by learners with two to three years' experience, with a response rate of 32.0%. The lowest response was from the learners with one to two years' experience.

5.3 Section B: Analysis and discussion of data

In Section A, the demographic representation of the data was discussed. The study shows that most of the learners who responded to the survey are between the ages of seventeen and nineteen years, with a 59.1% response rate, and most respondents were female, with a response rate of 59.5%. Section B reveals the descriptive analysis, with the construct's reliability and validity, and covariance structure analysis.

5.3.1 Descriptive statistics of variables

The descriptive analysis for the UTAT2 variables data is demonstrated in Table 5.2.

Table 5.2: Descriptive analysis

Variable	N	Mean	Std Dev	Minimum	Maximum
Performance Expectancy (PE)	259	3.71	0.87	1.00	5.00
Effort Expectancy (EE)	259	3.87	0.79	1.00	5.00
Social Influence (SI)	259	2.26	0.86	1.00	4.67
Facilitating Conditions (FC)	259	2.55	0.99	1.00	5.00
Hedonic Motivation (HM)	259	3.8	0.91	1.00	5.00
Habit (H)	259	3.33	0.83	1.25	4.75
Behavioural Intention (BI)	259	3.67	0.92	1.00	5.00
Use Behaviour (UB)	259	3.42	0.67	1.00	5.00

There were two-hundred and fifty-nine responses obtained from this study. By observing the standard deviation column, the feedback shows that the responses from variables were concentrated around the mean. There was no standard deviation that was above one on average. This indicates that the study did not deviate from the mean.

5.3.2 Factors that affect the behavioural intention of smartphone use

Table 5.2.1: Performance Expectancy (PE)

PE	Performance Expectancy	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
PE1	I find using my phone very helpful for my schoolwork.	5.8	4.6	8.9	38.6	42.1
PE2	Using my phone always helps me in getting my schoolwork done.	5.4	8.5	12.4	43.0	30.6
PE3	Using my phone helps to improve my schoolwork.	6.6	10.0	20.1	40.5	22.8
PE3	Using my phone helps in increasing my marks.	8.9	11.6	34.4	30.1	15.1

Performance expectancy questions were asked to understand how the learners feel about the performance of their smartphones. The learners responded to the first item: “I find using my smartphone very helpful for my schoolwork”, (PE1). A total of 42.1% of the learners strongly agree, and 38.6% of the learners agree that using their smartphones is helpful. However, 5.8% of the learners disagree that using their phones helps them do their schoolwork.

The second item is: “Using my phone always helps me in getting my schoolwork done”, (PE2). Of the learners, 43.0% agree, and 30.6% strongly agree that using their phones is very helpful for their schoolwork, while only 5.4% of the learners strongly disagree.

In Item 3, only 40.5% of the learners agree, and 22.8% of the learners strongly agree that using their smartphones helps them to improve their schoolwork. Then again, 20.1% of the learners responded neutrally, while 6.6% of the learners disagree.

In the last item, (PE4), learners were asked if using their smartphones helps them to increase their marks. About 34.4% of the learners responded neutrally, while 30.1% of the learners agree, 8.9% of the learners strongly disagree, and 15.1% of the learners strongly agree.

Table 5.2.2: Effort expectancy (EE)

EE	Effort Expectancy	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
EE1	Using my phone helps me to understand my schoolwork	6.6	8.9	15.4	40.2	29.0
EE2	Using my phone helps me to do more schoolwork.	5.4	11.6	18.1	43.2	21.6
EE3	It is easy for me to do my schoolwork using my phone.	6.9	9.7	16.2	39.4	27.8
EE4	My phone is easy to operate	2.3	3.5	9.3	25.5	59.5

The study shows that over 40% of the learners agree, and 29.0% of the learners strongly agree that using their smartphones helps them to understand their schoolwork (EE1). In the following question, 43.2% of the learners agree, and 29.0% of the learners strongly agree that using their smartphones helps them to understand their schoolwork (EE2).

Learners were asked if it is easy to do their schoolwork using smartphones (EE3). Of the learners, 39.4% agree, 27.8% of the learners strongly agree, and only 9.7% of the learners disagree that it is easy to do their schoolwork using a smartphone. Furthermore, learners were asked if it is easy to operate their smartphones (EE4). Of

the learners, 59.5 % strongly agree, and 25.5% of the learners agree, while 3.5% of the learners disagree that it is easy to operate their smartphones.

Table 5.2.3: Social Influence (SI)

SI	Social Influence	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
SI1	My friends help me to understand how to use my phone.	50.8	26.4	10.5	8.9	3.5
SI2	My parents help me to understand how to use my phone.	42.9	29.3	7.3	13.9	6.6
SI3	I use my phone in doing my schoolwork because I saw my friends using their phones to do schoolwork.	24.7	23.2	12.4	29.0	10.8

First, (S1) 50.8% of the learners disagree that they needed help from their friends to understand how to use their smartphones, while 8.9% of learners agree to needing help from friends, and 10.5% of the learners responded neutrally.

Secondly, (S2) 42.9% of the learners disagree that they needed help from their parents on how to use their smartphones, while 13.9% agree and 7.3% of the learners responded neutrally when they were asked.

Moreover, (S3) 29.0% of learners agree that they use their smartphones to do schoolwork because they saw their friends using their smartphones to do schoolwork. In contrast, 24.7% of the learners strongly disagree that they use their smartphones to do their schoolwork for this reason, and 12.4% of the learners responded neutrally.

Table 5.2.4: Facilitating Conditions (FC)

FC	Facilitating Conditions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
FC1	I always have airtime on my phone.	35.5	27.8	20.1	10.4	6.2
FC2	I always have data on my phone when I am at school.	30.1	25.9	12.7	21.2	10.0

FC3	I always have data on my phone when I am at home.	17.4	24.3	18.5	27.0	12.7
FC4	I always have access to free data.	22.4	29.0	32.8	10.4	5.4

Most of the learners responded negatively when asked whether they always have airtime (FC1): 35.5% strongly disagree, 20.1% of the learners responded neutrally, while 27.8% disagree that they always have airtime.

When the learners were asked whether they always have data at school (FC2), 30.1% of the learners strongly disagree, 12.7% of the learners responded neutrally, while 21.2% of the learners agree that they always have data at school.

Furthermore, the learners were asked whether they always have data when at home (FC3). Of the learners, 24.3% disagree, 18.5% of the learners responded neutrally, while 27.0% of the learners agree that they have data when at home.

When the learners were asked whether they always have access to free data (FC4), 32.8% of the learners responded neutrally, 29.0% of the learners disagree, but in contrast to this, 10.4% of the learners agree that they always have access to free data.

Table 5.2.5: Hedonic motivation (HM)

HM	Hedonic Motivation	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
HM1	Using my phone for schoolwork is fun.	7.3	7.3	12.7	35.9	36.7
HM2	Using my phone for schoolwork is enjoyable.	3.5	7.4	15.9	37.6	35.7
HM3	Using my phone for schoolwork is entertaining.	5.0	10.0	23.2	40.5	21.2
HM4	I derive pleasure in using my phone for my schoolwork	3.9	8.9	20.8	42.1	24.3

The learners responded positively when asked whether using their smartphones is fun (HM1). Of the learners, 36.7% strongly agree, 35.9% of the learners agree, and 12.7%

of the learners responded neutrally. However, 7.3% of the learners disagree that it is fun to use their smartphones.

Afterwards, learners were asked whether using their smartphones for schoolwork is enjoyable (HM2). Of the learners, 37.6 % agree, 35.7% of the learners strongly agree, and 15.9% of the learners responded neutrally. However 7.4% of the learners disagree that they enjoy using their smartphones for schoolwork.

Again, the learners were asked whether using their smartphones is entertaining (HM3). Of the learners, 40.5% agree, 21.2% of the learners strongly agree, and 23.2% of the learners responded neutrally. In contrast, 10.0% of the learners disagree that using their smartphones is entertaining.

In addition, learners were asked whether they derive pleasure in using their smartphones for schoolwork (HM4). Of the learners, 42.1% agree, 24.3% of the learners strongly agree, and 20.8% of the learners responded neutrally. However, 8.9% of the learners disagree that they derive pleasure in using their smartphones for schoolwork.

Table 5.2.6: Habit (H)

H	Habit	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
H1	I use my phone in and out of the classroom.	24.7	12.7	6.9	10.4	45.2
H2	I use my phone everywhere I go.	11.6	21.3	13.2	18.6	35.3
H3	I always use my phone for my schoolwork.	4.6	12.4	32.0	35.5	15.4
H4	I may not use my phone for my schoolwork.	14.3	22.1	22.1	29.8	11.6

About 45.2% of the learners strongly agree that they use their smartphone in and out of the classroom (H1), 10.4% of the learners agree but, in contrast, 24.7% of the learners strongly disagree that they use their smartphone in and out of the classroom.

The learners were asked whether they use their smartphones everywhere they go (H2). Of the learners, 35.3% strongly agree, 13.2% of the learners responded neutrally, while 21.2 % of the learners disagree that they use their smartphones everywhere they go.

Next, learners were asked whether they use their smartphones for schoolwork (H3). Of the learners, 35.5% agree, 32.0% of the learners responded neutrally, while 12.4% of the learners strongly disagree that they use their smartphones for schoolwork.

Also, learners were asked whether they may not use their smartphones for their schoolwork (H4). Of the learners, 29.8% agree, 22.1% of the learners responded neutrally, while 22.1% of the learners strongly disagree that they may not use their smartphones for schoolwork.

Table 5.2.7: Behavioural intention (BI)

BI	Behavioural Intention	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
BI1	I will continue using my phone in future for my schoolwork.	5.4	6.2	17.8	28.2	42.5
BI2	I will always use my phone when doing my schoolwork.	4.3	12.0	34.9	31.8	17.1
BI3	I will continue to use my phone frequently in and out of the classroom.	13.6	17.8	8.1	16.3	44.2

First, the learners were asked whether they will continue using their smartphones to do their schoolwork in future (BI1). Of the learners, 42.5% strongly agree, while 6.2% of the learners disagree, and 17.8% of the learners responded neutrally.

Secondly, the learners were asked whether they will continue using their smartphones to do their schoolwork (BI2). Of the learners, 31.8% agree, while 12.0% of the learners disagree, and 34.9% of the learners responded neutrally.

In addition, the learners were asked whether they will continue to use their smartphones frequently in and out of the classroom (BI3). Of the learners, 44.2% strongly agree, while 17.8% of the learners disagree, and 8.1% of the learners responded neutrally.

Table 5.2.8: Use Behaviour

UI	Use Behaviour	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
UI1	How often do you use your phone to call your friends?	9.3	8.5	70.3	8.9	3.1
UI2	How often do you use SMS to talk to your friends?	9.3	15.1	56.0	13.5	6.2
UI3	How often do you use Facebook to talk to your friends?	12.4	5.8	18.2	40.7	22.9
UI4	How often do you use WhatsApp to talk to your friends?	4.2	1.9	8.9	27.4	57.5

Most of the learners responded neutrally when asked about their intention to use their smartphones. When learners were asked how often they use their smartphones to call their friends (UI1), about 70.3% of the learners responded neutrally, 8.9% of the learners agreed, while 9.3% of the learners strongly disagreed that they use their smartphones to call their friends.

The learners were asked whether they use SMS to communicate with their friends (UI2). Of the learners, 56.0% responded neutrally, 13.5% of the learners agreed, while 15.1% of the learners strongly disagreed.

Furthermore, the learners were asked how often they use Facebook to communicate with their friends (UI3). Of the learners, 40.7% agree, 22.9% of the learners strongly agree, and 18.2% of the learners responded neutrally. But 12.4% of the learners strongly disagree that they use Facebook often to communicate with their friends.

Finally, learners were asked how often they use WhatsApp to communicate with their friends (UI4). Of the learners, 57.5% strongly agree, 27.4% agree, and 8.9% of the learners responded neutrally, while 4.2% of the learners strongly disagree that they often use WhatsApp to communicate with their friends.

5.4 Validity and reliability

Bhatiasevi (2016) indicates that data analysis is done in two stages. The primary phase is to analyse the measurement validity, and the second phase is to study "the structural model to test the proposed model as well as the hypotheses" (Bhatiasevi, 2016:806). In this research, construct soundness and dependability were done to examine the reliability of scales utilising Cronbach's alpha. The analysis of the outcomes was computed with IBM SPSS Amos 23.0.

5.4.1 Construct reliability

Construct reliability shows how fit a construct is when its objects are computed and evaluated based on Cronbach's alpha and composite reliability (Chao, 2019). The reliability and uniformity of each construct in this research were computed using Cronbach's coefficient alpha. Cronbach's coefficient alpha is used to calculate inner uniformity coefficients of the objects in the questionnaire (Taber, 2018:12). In this study, the guidelines from Taber (2018:6-7) were used to evaluate the reliability coefficient.

Table 5.4.1: Reliability and validity of construct

Cronbach's Coefficient Alpha			
Construct	**Raw Variable**	**Standardised Variable**	**Number of Items**
Performance Expectancy	0.774868	0.774615	4
Expectancy	0.691236	0.688899	4
Social Influence	0.691236	0.688899	3
Facilitating Conditions	0.794628	0.788020	4
Behaviour Intention	0.561964	0.554696	4

In the corresponding findings in Table 5.4.1, performance expectancy (0.77) and facilitating conditions (0.79) have high consistency because they fall within the range of 0.76 to 0.79. Secondly, effort expectancy (0.69) and social influence (0.69) have reasonable consistency. Lastly, behavioural intention (0.56) has acceptable consistency because it is within the range of 0.45 to 0.97.

5.4.2 Construct validity

To achieve this, thirty-two questions adapted from Venkatesh et al. (2012) were drafted and designed to fit the aim of this study. In order to claim that a questionnaire is valid, Al-Adwan, Al-Madadha and Zvirzdinaite (2018) mention that the average value of each construct should be ≥ 0.5. All the constructs have performed well.

5.4.3 Content validity

The questionnaire was drafted and discussed with the co-supervisor and sent for suggestions and input to the supervisor. A colleague was also invited to give input. After all the inputs were incorporated, ten questionnaires were distributed to high school learners to test the easiness and understanding of the questionnaire. The

feedback received from learners confirmed that the questionnaire's content was valid, understandable and easy to answer.

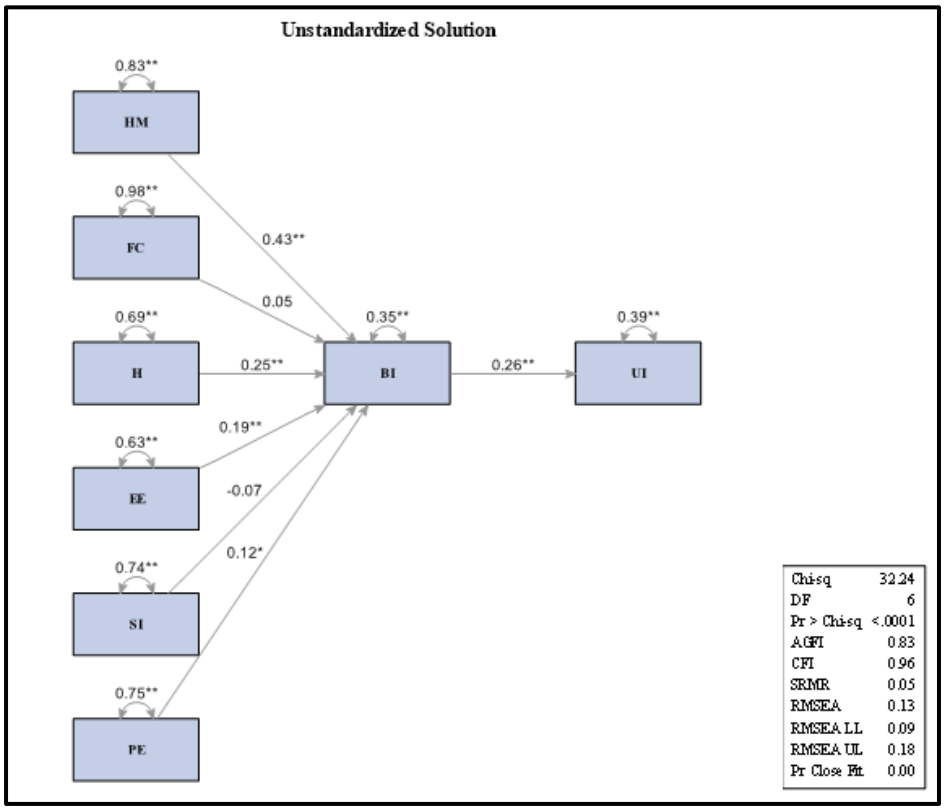

Figure 5.1: Structural model

5.4.4 Model fit test

The Structural Equation Model (SEM) is defined as a statistical method to examine the associations between the experimental and reliant variables (Khine, 2013). The SEM is chosen because the relationship between numerous experimental and reliant variables can be achieved concurrently (Bhatiasevi, 2016:806). The structural model with model fit indices such as Chi-Square(Chi-Sq), Degrees of Freedom (DF), Adjusted Goodness of Fit Index (AGFI), Comparative Index (CFI), and Root Mean Square Error of Approximation (RMSEA) is presented.

The purpose of model fitting is used to decide how closely the data fits the model (Khine, 2013:16) Chi-sq is 32.24; the smaller, the better. DF is 6, which is not within the recommended range, as Chen (2014) indicated. The CFI is 0.96, which is within the recommended value of ≥0.9, and AGFI is 0.83, which is within the recommended value of ≥0.8. The mathematical representation of the model is:

UI = 0.26BI + 0.43HM + 0.25H + 0.19EE - 0.07SI + 0.12PE.

The approximation of RMSEA is 0.13, which is above the recommended value of ≤0.08. This indicates poor fit indices and that there is an opportunity for improvement. The root mean square error residual (RMR) is 0.05, which is within the recommended value of ≤0.5.

The total number of students who took part in the study is two hundred and fifty-nine. The study revealed that learners use smartphones to do schoolwork. Learners say it is easy, entertaining and it takes less effort to do schoolwork with their phones.

Main findings of the hypotheses:

PE: 42.1% of the learners say their smartphones help them to do schoolwork and improve their performance.

EE: 59.5% of the learners say their smartphones are easy to operate.

SI: 50.8% of the learners strongly agree that their friends did not help them to operate their phones, and 42.9% of the learners strongly agree that their parents did not help them to operate their phones.

FC: 35.5% of the learners strongly agree that they do not always have airtime and 29.0% of the learners disagree that they have access to free Wi-Fi.

HM: 40.5% agree that entertainment is the major motivating factor for using their phones.

H: 45,2% of the learners strongly agree that they use their phones everywhere they go, and 35,3% strongly agree that they use their phones in and outside the classroom.

BI: 42.5% of the learners strongly agree that they use their phones in future to do schoolwork.

U: 40.7% of the learners agree that they use Facebook, and 57.5% of learners strongly agree that they use WhatsApp to communicate with their friends.

5.4.5 Covariance structure analysis

The correlation coefficient is used to assess the strength and the direction of the linear relationship among pairs of continuous variables (Gogtay & Thatte, 2017). Table 5.4.1 presents the path list of the hypotheses proposed in Chapter 3. The path analysis was conducted to examine the correlation and the significance of the hypotheses within the study. (Khine, 2013). Table 5.4.1 presents the estimation of data, which is based on standardised errors of parameter estimates.

The Pearson correlation was performed to measure the strength of the linear relationship between BI and PE, EE, SI, FC, HM and H to BI. A further linear relation between UI and BI was performed. Khine (2013) indicates that if the critical values or t-values of more than 1.96 are significant at the 0.05 level. The results in Table 5.4.2 indicate that not all hypotheses (**H**) were supported.

Table 5.4.2: Standardised results for path list and variance parameters

Standardised results for path list							
Path			**Parameter**	**Estimate**	**Standard Error**	**t-Value**	**Pr > |t|**
PE	**===>**	**BI**	_Parm1	0.11179	0.05678	1.9691	0.0489
EE	**===>**	**BI**	_Parm2	0.16600	0.06235	2.6625	0.0078
SI	**===>**	**BI**	_Parm3	-0.06491	0.04253	-1.5263	0.1269
FC	**===>**	**BI**	_Parm4	0.05698	0.04103	1.3887	0.1649
HM	**===>**	**BI**	_Parm5	0.43056	0.04997	8.6171	<.0001
H	**===>**	**BI**	_Parm6	0.22727	0.05021	4.5259	<.0001
BI	**===>**	**UI**	_Parm7	0.35279	0.05451	6.4723	<.0001

H_1: *Performance expectancy is the extent to which a student believes that using their smartphone helps them to do their work.*

From Table 5.4.2, performance expectancy is supported by the study because it has a p-value of 0.0489; therefore, performance expectancy impacts the behavioural intention of learners to use their smartphones for schoolwork. It was demonstrated by Venkatesh et al. (2003); and by Nassuora (2013) that performance expectancy is a significant predictor of behavioural intention to use a system.

H_2: *Effort expectancy, describe how easy it is for learners to use their smartphones.*

Hypothesis H_2 has a p-value of 0.0078. This indicates that effort expectancy influences students' behavioural intention to use smartphones. This finding is also supported by the Taiwo and Downe (2013) study . Both studies show that effort expectancy is a significant predictor of behavioural intention to use a system (Taiwo & Downe, 2013).

H_3: *Social influence is described as the extent to which a learner's decision to use the smartphone is influenced by people close to them.*

The parents' and friends' influence on learners to use smartphones plays a significant role (Moshi et al., 2018), but the findings indicate that social influence is not a predictor of the behavioural intention of learners to use their smartphones. This is indicated by the t-value of -0.15263 for H_3 SI, which negatively affects behavioural intention to use smartphones. In contrast, the study by Taiwo and Downe (2013) proves that social influence is a predictor of behavioural intention to use a system.

H_4: *Facilitating condition is described as the degree to which learners have faith that an organisation and "technical infrastructure" is there to back up the utilisation of smartphones.*

According to the research, most of the students spend most of their time calling and texting their friends and families (Ali, Al-Joudi & Snell, 2019), but 29% of the learner respondents in the study state that they do not always have airtime and data. The study discovered that facilitating condition is not the predictor of the behavioural intention of learners to use smartphones. Table 5.4.1 indicates that H_4 FC has a p-value of 0.1649, and it has a t-value of 1.3887, which is not an acceptable value because the p-value is not < 0.05 level.

H_5: *Hedonic motivation is the fun or pleasure derived from using a smartphone.*

Over 36% of the learners find their smartphone fun, enjoyable and entertaining. This was also verified in Table 5.4.2, where the hypothesis H_5 has a p-value of <.0001. Therefore, H_5 is supported by this study. The studies by Venkatesh et al. (2012) and Chopdar and Sivakumar (2019) also supported HM as a predictor of behavioural intention to use mobile technology.

H_6: *Habit positively influences the intention to use smartphones.*

Hypothesis 6 has a p-value of <.0001, which means most learners' behavioural intention to use smartphones everywhere they go happens automatically.

H_7: *Behavioural intention of learners to use their smartphones*.

From the discussion under facilitating conditions (H_4), most learners disagree that they always have access to data, but their preferred mode of communication is through Facebook and WhatsApp. Therefore, learners' behavioural intention to use smartphones is indicated by a p-value of <.0001. It is clear from Table 5.4.1 that the hypotheses H_1 PE, H_2 EE, H_5 HM and H_6 H indirectly affects the behavioural Intention to use smartphones and hypotheses H_7 BI directly influences the behavioural intention to use a smartphone.

Table 5.4.3: Hypotheses test results

Hypotheses	Path	Results
H_1	Performance Expectancy: the extent to which a student believes that using their smartphone helps them to do their work.	Supported
H_2	Effort Expectancy: how easy it is for learners to use their smartphones.	Supported
H_3	Social Influence: the extent to which learners' decision to use their smartphones is influenced by people close to them.	Not supported
H_4	Facilitating Conditions: the extent to which learners trust that an organisation and technical infrastructure is present to back up the utilisation of smartphones.	Not Supported
H_5	Hedonic Motivation: the fun or pleasure derived from using a smartphone.	Supported
H_6	Habit: positively influences the intention to use smartphones.	Supported
H_7	Behavioural Intention of learners to use their smartphones.	Supported

5.5 Conclusion

The data from the study was interpreted and discussed in this chapter. The discussion started by analysing the demographic information in Section A, followed by descriptive statistics of variables in Section B. The discussion was concluded with the interpretation of the hypotheses test results.

In Section A, the demographic responses from the data were discussed. From Table 5.1, it was discovered that out of a total of two hundred and fifty-nine learners who participated in the study, the highest response rate of 59.1% of the learners are between the age of seventeen and nineteen years and that most respondents were female with a response rate of 59.5%.

Learners with the least experience were not interested in the study. Their response rate of 14.7% is low. The main findings are that 59.1% of respondents were between the ages of seventeen and nineteen years and that 59.5% of the respondents were females.

The hypotheses PE, EE, HM, H and BI, have the highest significance level, while hypothesis SI and FC was not significant to the study. From SEM in Table 5.4.1, SI has a value of -0.7, and from the path analysis (Table 5.4.2), it has a t-test of -1.5263. FC is also not significant to the study; the p-value of 0.6149 is greater than the 0.05 level. BI is also a determinant use of smartphones.

Chapter 6 is the final chapter to present the conclusion and make recommendations for future work.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This research was conducted to study the adoption of smartphone use on high school learners. The purpose of the research was to examine the impact of smartphone use on learners, study in detail the literature review on smartphones, and what apps learners use most on their phones.

The study discussed the evolution of smartphones, the advantages and disadvantages of learning with smartphones, factors affecting students learning with smartphones and opportunities for learning with smartphones. The study discussed five concerning factors that affect learning with smartphones: cheating, texting, addiction, security, and cyberbullying.

The main advantage of using smartphones for learning is the size since compared to laptops, smartphones are portable and can be carried anywhere and at any time. Most smartphones have pre-installed applications such as Facebook, Twitter, WhatsApp, YouTube and Instagram. These provide instant communication and sharing of media clips, such as images and videos among users.

Technical aspects, such as screen size, different operating systems, and data accessibility that affect the use of smartphones were also discussed. Technology has changed the way people manage daily activities such as shopping, banking, organising our diaries and learning. High school students should also enjoy the benefits that come with the current evolving technology; therefore, it was important to study the use of smartphones in high schools.

Quantitative research was then done in three high schools in Gauteng, in the Ekurhuleni region. The survey was focused on high school learners, and two hundred and fifty-nine learners participated in the study. In conjunction with UTAUT constructs, the outcome of the responses formed the factors that were used in the study and singled out those factors that can impact learners' use of smartphones.

Therefore, the discussion around hypothesis testing validates the conceptualised proposed research model to enhance smartphones for effective use. As summarised in Figure 6.1, the eight hypotheses are: *performance expectancy* (H_1), *effort expectancy* (H_2), *facilitating conditions* (H_3), *social influence* (H_4), *hedonic motivation* (H_5), *habit* (H_6), and *behavioural intention* towards use (H_7). Two hypotheses FC and SI, were not statistically significant to the study. The following section focuses on the outcome of the hypothesis.

6.2 Research outcome

From Table 5.4.1 and Figure 6.1, H_1 performance expectancy, H_2 effort expectancy, H_5 hedonic motivation, H_6 habit, and H_7 behavioural intention are supported by the study, except H_3 social influence and H_4 facilitating condition. From the study, learners have fun and enjoy using their smartphones; they can use them anytime and anywhere they go, even if they do not always have data. Learners prefer to use WhatsApp and Facebook for communication. These apps influence them to use their smartphones.

The learners find it easy to do schoolwork when using their smartphones; it helps them understand and do more schoolwork. Using their smartphones also helped them increase their marks; therefore, using smartphones positively impacts learners' performance.

From the feedback received, “social influence is not the important predictor of behavioural intention” of learners to use smartphones. Out of the two hundred and fifty-nine learners, 50.8% of learners strongly disagree that their friends helped them to use their phones, and 42.9% of the learners disagree that friends helped them to understand their phones. These days, learners can efficiently operate their smartphones without any assistance that influence their behavioural intention to use smartphones.

In Chapter 5, Table 5.1, the path analysis of “social influence on behavioural intention” of smartphone use is not supported, and the structural representation in Table 5.4.1 of the model also shows that the social influence path takes a negative direction. The structural representation of the model is in Figure 6.1, and social influence is taking a different approach. Again, looking at the response rates, almost half of the learners who responded disagree that they use their smartphones because they saw their friends using their smartphones to do their schoolwork.

Social influence is not significant to the study. The reason can be because most of the students have two or more years of experience using smartphones, and they can easily operate their smartphones. Another reason is that learners are born into a technological era, so they adapt easily to mobile phone usage (Zulkefly & Baharudin, 2009). Other studies also reveal that “social influence is not the predictor of behavioural intention to use system”, e.g. the studies by Saputra et al. (2019) and by Al-Adwan, Al-Madadha and Zvirzdinaite (2018).

Facilitating Conditions is not significant to the study. The study revealed that most students do not always have access to data and airtime. Arain et al. (2019) discovered that Facilitating Condition is not a significant predictor of students’ behavioural

intention towards mobile learning acceptance, and Dhiman et al. (2019) also discovered that Facilitating Condition is not significant to the consumers of smartphones app(s). The novelty of the study is that no study of smartphone adoption was done with these learners before. The study's contribution is the new model that is produced by this research. Below is Figure 6.1, which is the structural representation of the new model.

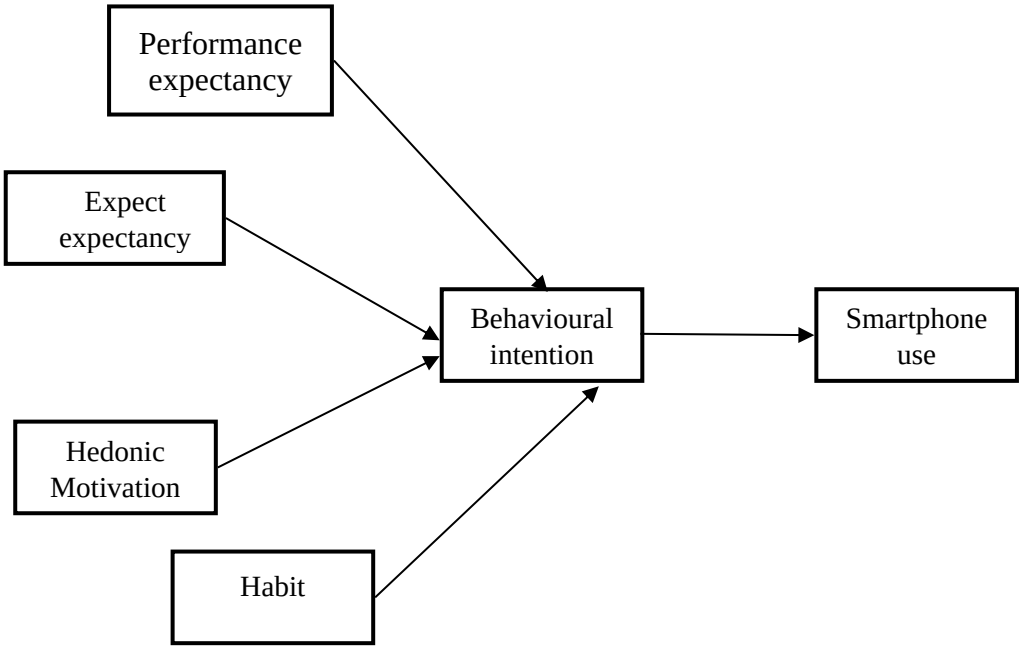

Figure 6.1: Effects of smartphone usage model – output model

The highest response of 59.1%, Table 5.1 is from learners between the ages of seventeen and nineteen years, and most are females 59.5%, Table 5.1 with more than three years' experience. This study reveals that older learners have more experience using smartphones and are not easily influenced by others. Therefore, the constructs: performance expectancy, effort expectancy, hedonic motivation, and habit influence are the predictors of the behavioural intention of learners to use smartphones.

Because students are growing up in a technological era, learners in higher grades have experience using smartphones, so it is easy for them to operate their phones without help from friends or families, so the Social Influence construct is not significant to the study. From Table 5.4.1, SI has a t-value of -0.15263, and a p-value of 0,1269, which indicates that the t-value has a negative effect and the p-value is not < 0.05 level on behavioural intention to use smartphones therefore, the construct SI is dropped in the new model Figure 6.1.

This study surveyed secondary school pupils, and due to the nature of the children, they relied solely on their parents to reimburse them for sorting out airtime and data which are needed for Internet connectivity. Unfortunately, the majority of these parents do not see how supportive information from the Internet can help improve the understanding of their children's education (Nichoil et al., 2017).

And Facilitating conditions construct is also not significant to the study. Table 5.4.1 indicates that the FC has a p-value of 0.1649, and it has a t-value of 1.3887, which is not an acceptable value because the p-value is not < 0.05 level. Therefore, construct FC is not supported by the results because most students do not always have data or access to free data and airtime, according to the findings. The fact that the Government provides free Internet in the Province of Gauteng, these school pupils because of their age, are restricted going to public places alone, not to mention using Internet facilities for learning purposes.

The most significant discovery is that learners in the Ekurhuleni region, Tembisa, do not have access to data and free Wi-Fi even though they prefer to communicate on WhatsApp and Facebook. Both apps need data to function, therefore it is important school governing bodies find ways of providing free data or Wi-Fi to learners.

6.3 Research limitations

The key challenge in the research was the literature review of smartphone use by high school learners in South Africa. Owing to the limitation of resources, the study was conducted in Gauteng, in the Ekurhuleni region, and it was a challenge because of the limited time provided by the Department of Education . Lastly, moderating factors such as gender, age and experience were excluded from giving insight regarding evidence on the relationships between the constructs.

6.4 Future research

The research was conducted in one region. In future, the study could be extended to cover all the regions in Gauteng. Principals and teachers were not included in the survey; their perceptions should also be considered in the future. Only one methodology was adapted to conduct the research. To get more insight into the study, a survey together with interviews could be used.

6.5 Conclusion

The study was conducted to investigate the impact of smartphones on high school learners' performance and examine the factors that can influence smartphone usage on learners. Most learners strongly agreed that using their smartphones is fun, entertaining, and enjoyable since they can study anywhere , and anytime. Hedonic motivation has a significant impact on behavioural intention to use smartphones, followed by Habit.

The findings revealed that Smartphones helps the learner to do their schoolwork to improve their marks, and it is also easy to operate; this explains why performance

expectancy and effort expectancy are perceived as predictors of behavioural intention to use smartphones by learners.

From the study, factors that positively contributed to the use of smartphones by learners are that: they can use their smartphones anywhere and at any time; it helps them to do their schoolwork; it is easy to operate; they derive pleasure from using their smartphones; their smartphones are entertaining, and they enjoy using them to do schoolwork.

In contrast, the study reveals that learners are not easily influenced by friends and parents to use their smartphones, and learners do not always have resources such as Wi-Fi, data and airtime that enable them to use their smartphones. Therefore, it is facilitating conditions and social influence that were not perceived as significant predictors to behavioural intention to use smartphones.

If the Department of Education wants to adopt smartphones as a teaching and learning tool, they must introduce the use of smartphones at lower grade levels and find a way to motivate the students at lower levels to use them because most of the students who responded positively to the survey are from higher grade levels. Students do not always have access to data or free Wi-Fi.

The Department of Education needs to find a way to improve infrastructure so that learners can have access to free Wi-Fi or data in high schools and make educational websites freely available to them. Most of the learners preferred to use Facebook and WhatsApp for communication. Mobile phone designers should offer smartphones with these applications to educators and learners at a low cost.

The study can help increase awareness of learning with smartphones and contribute to the integration of smartphone use in schools, taking into consideration the advantages and disadvantages of learning with smartphones.

The study contributes to the theory of smartphone use in the South African school context, particularly in Gauteng, Ekurhuleni region.

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APPENDIX A: DATA COLLECTION INSTRUMENT FOR THE SURVEY

Unisa Ref: 044/SFM/CSET_SOC
GDE Ref: D2017/342

Section A: Demographic Profile

In this section we would like you to fill in your demographic details. The gender will be coded as 0 = males and 1 = females. And race 1= black, 2 = Coloured, 3 = White and 4 = Indians

Please tick X in the appropriate box.

1 Please specify your g**ender**

☐ Male ☐Female

2 What race do you belong to?

☐Black ☐Coloured ☐White ☐Indian

3 What grade are you currently in?

☐Grade 8 ☐Grade 9 ☐Grade 10 ☐Grade 11 ☐Grade 12

4 How old are you?

☐12 – 16 years ☐17 – 19 years ☐20 – 22 years ☐23 - 25 years ☐25 and above

5 How long have you been using phone?

☐0 – 1 year ☐1 – 2 year ☐2 – 3 year ☐3 years and more

Section B (UTAUT 2)

This section is seeking your opinion on using the smartphone. Students are asked to agree or disagree to the extent which each statement using Linkert scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree. Please tick in the box provided to indicate if you agree or disagree.

Performance expectancy (PE) is the extent to which a student believes that using their phone will help them to do their work.

Performance expectancy						
	Questions	**Strongly disagree**	**disagree**	**Neutral**	**Agree**	**Strongly agree**
PE1	I find using of my phone very helpful for my school work.					
PE2	Using of my phone always helps me in getting my school work done.					
PE3	Using my phone helps to improve my school work.					
PE4	Using my phone helps in increasing my marks.					

Effort expectancy (EE) explains how easy it is for students to use their phone.

Effort Expectancy						
	Questions	**Strongly disagree**	**disagree**	**Neutral**	**Agree**	**Strongly agree**
EE1	Using my phone helps me to understand my school work					
EE2	Using my phone helps me to do more school work.					
EE3	It is easy for me to do my school work using my phone.					
EE4	My phone is easy to operate					

Social Influence (SI) is the degree to which students perceived that important others believe that he or she should use the system.

Social Influence						
Questions		Strongly disagree	disagree	Neutral	Agree	Strongly agree
SI1	My friends help me to understand how to use my phone.					
SI2	My parents help me to understand how to use my phone.					
SI3	I use my phone in doing my school work because I saw my friends using their phones to do school work.					

Facilitating condition (FC) is defined as the degree to which students believes that an organisation and technical infrastructure exists to support the use of his/her phone.

Facilitating condition						
Questions		Strongly disagree	disagree	Neutral	Agree	Strongly agree
FC1	I always have airtime on my phone.					
FC2	I always have data on my phone when I am at school.					
FC3	I always have data on my phone when I am at home.					
FC4	I always have access to free data.					

Hedonic motivation (HM) is defined as the fun or pleasure derived from using your phone.

Hedonic Motivation						
Questions		**Strongly disagree**	**disagree**	**Neutral**	**Agree**	**Strongly agree**
HM1	Using my phone for school work is fun.					
HM2	Using my phone for school work is enjoyable.					
HM3	Using my phone for school work is entertaining.					
HM3	I derive pleasure in using my phone for my school work					

Habit (H) is defined as the extent to which students tend to perform behaviours automatically because of learning

Habit						
Questions		**Strongly disagree**	**disagree**	**Neutral**	**Agree**	**Strongly agree**
H1	I use my phone in and out of classroom.					
H2	I use my phone everywhere I go to.					
H3	I always use my phone for my school work.					
H4	I may not use my phone for my school work.					

Section C (Behavioral Intention)

This section is seeking your opinion on behavioral intention on using the smartphone. Students are asked to agree or disagree to the extent which each statement using

Behavioral intention (BI) is the intention of a student to use his/her phone.

Behavioral Intention						
Questions		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
BI1	I will continue using my phone in future for my school work.					
BI2	I will always use my phone when doing my school work.					
BI3	I will continue to use my phone frequently in and out of classroom.					

Section D (Use of smartphone)

This section is seeking your opinion on using the smartphone. Students are asked to agree or disagree to the extent which each statement using

Use of smartphone						
Questions		Never	Almost never	Sometimes	Almost every time	Every time
U1	How often do you use your phone to call your friends?					
U2	How often do you use SMS to talk with your friends?					
U4	How often do you use Facebook to talk to your friends?					
U5	How often do you use WhatsApp to talk to your friend?					

APPENDIX B: CSET ETHICS AND RESEARCH COMMITTEE

UNISA university of south africa

UNISA COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY'S (CSET) RESEARCH AND ETHICS COMMITTEE

6 October 2016

Ref #: 044/SFM/CSET_SOC
Name : Sekana Faith Mokwana
Student #: 32492065

Dear Miss Sekana Faith Mokwana

Decision: Ethics Approval for 3 years, humans involved

Researcher: Miss Sekana Faith Mokwana
248 Chaucer Avenue, no 2 New Haven, Groblerspark, 1728
mokwanaf@yahoo.com, +27 83 615 3542

Supervisor (s): Prof. Alfred Coleman
colema@unisa.ac.za, +27 11 670 9108
Mr. Olugbenga Adenuga
adenugaa@gmail.com, +27 73 713 2905

Proposal: A conceptual model to study the effects of smartphones on high school students

Qualification: Masters of Science

Thank you for the application for research ethics clearance by the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee for the above mentioned research. Ethics approval is granted for three years from 6 October 2016 to 6 October 2019.

1. The researcher will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Unisa College of Science, Engineering and

RECEIVED
2016 -10- 07
OFFICE OF THE EXECUTIVE DEAN
College of Science, Engineering and Technology

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Technology's (CSET) Research and Ethics Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.

3. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.
4. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
5. Permission to conduct research in a state school should be obtained from the Department of Education, the school principal and parents prior to commencing field work.

Note:

The reference number 044/SFM/CSET_SOC should be clearly indicated on all forms of communication with the intended research participants, as well as with the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee

Yours sincerely

Adèle da Veiga

Dr. A Da Veiga

Chair: Ethics Sub-Committee School of Computing, CSET

Prof I. Osunmakinde

Director: School of Computing, CSET

Prof I. Alderton

Executive Dean (Acting): College of Science, Engineering and Technology (CSET)

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
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APPENDIX C: DEPARTMENT OF EDUCATION APPROVAL LETTER

For administrative use only:
Reference no: D2017 / 342
enquiries: 011 843 6503

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GDE RESEARCH APPROVAL LETTER

Date:	**31 October 2016**
Validity of Research Approval:	**6 February 2017 to 29 September 2017**
Name of Researcher:	**Mokwana S.F.**
Address of Researcher:	**P.O. Box 2697; Kempton Park; 1620**
Telephone / Fax Number/s:	**083 615 3642**
Email address:	**mokwanaf@yahoo.com**
Research Topic:	**Conceptual model to study effects of Smartphones on High School students.**
Number and type of schools:	**FOUR Secondary Schools**
District/s/HO	**Ekurhuleni North**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved. A separate copy of this letter must be presented to the Principal, SGB and the relevant District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted. However participation is VOLUNTARY.

The following conditions apply to GDE research. The researcher has agreed to and may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

CONDITIONS FOR CONDUCTING RESEARCH IN GDE

1. *The District/Head Office Senior Manager/s concerned, the Principal/s and the chairperson/s of the School Governing Body (SGB.) must be presented with a copy of this letter.*
2. *The Researcher will make every effort to obtain the goodwill and co-operation of the GDE District officials, principals, SGBs, teachers, parents and learners involved. Participation is voluntary and additional remuneration will not be paid;*
3. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal and/or Director must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*

01/11/2016

1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management ER&KM)

4. *Research may only commence from the second week of February and must be concluded by the end of the THIRD quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
5. *Items 3 and 4 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
6. *It is the researcher's responsibility to obtain written consent from the SGB/s; principal/s, educator/s, parents and learners, as applicable, before commencing with research.*
7. *The researcher is responsible for supplying and utilizing his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institution/s, staff and/or the office/s visited for supplying such resources.*
8. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research title, report or summary.*
9. *On completion of the study the researcher must supply the Director: Education Research and Knowledge Management, with electronic copies of the Research Report, Thesis, Dissertation as well as a Research Summary (on the GDE Summary template). Failure to submit your Research Report, Thesis, Dissertation and Research Summary on completion of your studies / project – a month after graduation or project completion - may result in permission being withheld from you and your Supervisor in future.*
10. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned;*
11. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director/s and school/s concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

.....

Mrs F.L. Tshabalala

Acting Director: Education Research and Knowledge Management

DATE: 01/11/2016

APPENDIX D: DISTRICT APPROVAL

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

Enquiries: Directorate: Education Operations & Support
Freddie Mokhachane (T) 011 746 – 8078 (F) 011 746 – 8296 (E) Freddie. Mokhashane@gauteng.gov.za

To: **SF Mokwana**

From: **Mrs NP Ntuta**
Acting District Director: Ekurhuleni North

Date: **15 May 2017**

Subject: **Proposal to conduct research – Concept Model to study the effects of Smartphones on High School Students**
Approval letter D2017/342

The Ekurhuleni North District Office acknowledges your request and hereby grants you permission to conduct research in the following schools:

1. Ingqayizivele Secondary School
2. Zitikeni Secondary School
3. Tembisa Secondary School
4. Boitumelong Secondary School
5. Thuto ke Matla Secondary School
6. Masisebenze High School
7. Masiqhakaze Secondary School

Please do not hesitate to contact Freddie Mokhachane on (011) 746-8078 for any clarity pertaining to this matter or for any information required.

Yours in Education

Mrs NP Ntuta
Acting District Director: Ekurhuleni North

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

GDE AMENDED RESEARCH APPROVAL LETTER

Date:	**04 April 2018**
Validity of Research Approval:	**05 February 2018 – 28 September 2018** **D2017/342A**
Name of Researcher:	**Mokwana S.F**
Address of Researcher:	**P O Box 2697**
	Kempton Park
	1620
Telephone Number:	**083 615 3642**
Email address:	**mokwanaf@yahoo.com**
Research Topic:	**Conceptual model to study effects of Smartphones on High School students**
Type of qualification	**Masters in Computer Science**
Number and type of schools:	**Four Secondary Schools**
District/s/HO	**Ekurhuleni North**

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

05/04/2018

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

Subject: RE: Request for extension to conduct research

From: Nonceba.Ntuta@gauteng.gov.za
To: mokwanaf@yahoo.com
Date: Thursday, April 5, 2018, 12:37:59 PM GMT+2

Good day Faith

Please go ahead and finish your research work.

Thank you

From: Faith Mokwana [mailto:mokwanaf@yahoo.com]
Sent: 05 April 2018 10:45 AM
To: Nonceba Ntuta (GPEDU)
Subject: Request for extension to conduct research

UID09duf63i2bd

Dear Mrs Nonceba

I would like to thank you for the opportunity the department has provided to conduct research in 2017. However I did not manage to distribute and collect enough questionnaire, I therefore request the extension to continue with the survey these year (2018).

I have attached 2017 approval certificate from the district and the 2018 approval certificate from the Gauteng department of education for your convenience.

Kind regards

Faith

APPENDIX E: SCHOOLS APPROVAL

Principal's permission to conduct research in his/her school

I give you permission to approach learners to participate in the research entitled: CONCEPTUAL MODEL TO STUDY EFFECTS OF SMARTPHONES ON HIGH SCHOOL STUDENTS.

I have read the Research Information Statement explaining the purpose of the research and I understand that:

- The role of the school is voluntary.
- I may decide to withdraw the school's participation at any time without penalty.
- Learners from all grades will be invited to participate and the permission for them to participate will be required from them and from their parents.
- Only learners who has signed the consent form and whose parents has signed the consent form will participate in the research.
- All information obtained will be treated in strictest confidence.
- The learners' names will not be used and no individual will be identifiable in any written reports of the study.
- The school will not be identifiable in any written reports of the study.
- Participants may withdraw from the study at any time without penalty.
- A report of the findings will be made available to the school.
- If I seek further information on the research I can contact Sekana Faith Mokwana on 083 615 3542 or at mokwanaf@yahoo.com.

INGQAYIZIVELE H. SCHOOL — School Name

MAEBELA M. J. — Principal Name

17/08/2017 — Date

Signature

INGQAYIZIVELE HIGH SCHOOL
175/176 TSHENELONG SECTION
PO BOX 163 TEMBISA 1628
2017 -08- 17
TEL: 011 028 0208 FAX: 086 274 9742
Email: ingqayizivele.secondary@gmail.com
GAUTENG DEPARTMENT OF EDUCATION

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
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Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

Principal's permission to conduct research in his/her school

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- A report of the findings will be made available to the school.
- If I seek further information on the research I can contact Sekana Faith Mokwana on 083 615 3542 or at mokwanaf@yahoo.com.

Thuto-Ke-Matla — School Name

T.J Ramosmaba — Principal Name

28/09/2018 — Date

Signature

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- A report of the findings will be made available to the school.
- If I seek further information on the research I can contact Sekana Faith Mokwana on 083 615 3542 or at mokwanaf@yahoo.com.

TEMBISA SEC	NGWANE S C
School Name	Principal Name
17/08/2017	Ngwe
Date	Signature

Tembisa Secondary School
P.O. Box 38
Thembisa, 1623
2017 -08- 17

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392, UNISA 0003, South Africa
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www.unisa.ac.za

APPENDIX F: SAMPLE OF CONSENT FORMS

Parent Consent Form

B

CONSENT FOR PARENTS TO ALLOW HIS/HER CHILD TO PARTICIPATE IN THE STUDY

I, [redacted] (parent/guardian), confirm that the person asking my consent for my child to take part in the research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I had sufficient opportunity to ask questions and I give permission to my child to participate in the study.

I understand that my child's participation is voluntary and that he/she is free to withdraw at any time without penalty (if applicable).

I am aware that the findings of the study will be processed into a research report, journal publications and/or conference proceedings, but that my child's participation will be kept confidential unless otherwise specified.

If I have any questions about the research I can contact Sekana Faith Mokwana at mokwanaf@yahoo.com or call her on 0836153542.

☒ Yes – I would like my child to participate in the research

☐ No – I do not want my child to participate in the research.

Parent or Guardian Signature [redacted] Date 28/10/2018

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www.unisa.ac.za

Student Consent Form

UNISA

CONSENT FOR LEANERS TO PARTICIPATE IN THE STUDY

I, _____ agree to take part in this research and the researcher has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or the researcher has explained to me) and understood the study as explained in the information sheet.

I had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings and that my participation will be kept confidential.

If I have any questions about the research I can feel free to call the researcher Sekana Faith Mokwana at mokwanaf@yahoo.com, 0836153542.

☑ Yes – I want to participate in the research

☐ No – I do not want to participate in the research.

Signature _____. Date _____

APPENDIX G: LIST OF TABLES

Demographic information

School	Frequency	Percent	Valid Percent	Cumulative Percent
A	107	41.3	41.3	41.3
B	78	30.1	30.1	71.4
C	74	28.6	28.6	100.0
Total	259	100.0	100.0	
Age	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
12-16yrs	93	35.9	35.9	35.9
17-19yrs	153	59.1	59.1	95.0
20-22yrs	10	3.9	3.9	98.8
23-25yrs	3	1.2	1.2	100.0
Total	259	100.0	100.0	
Gender	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Male	104	40.2	40.3	40.3
Female	154	59.5	59.7	100.0
Missing	1	0.4		
Total	259	100.0		
Race	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
None	4	1.5	1.5	1.5
Black	251	96.9	96.9	98.5
Coloured	4	1.5	1.5	100.0
Total	259	100.0	100.0	
Grade	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
Grade 8	57	22.0	22.0	22.0
Grade 9	56	21.6	21.6	43.6
Grade 10	42	16.2	16.2	59.8
Grade 11	59	22.8	22.8	82.6
Grade 12	45	17.4	17.4	100.0
Total	259	100.0	100.0	
Years of Experience	**Frequency**	**Percent**	**Valid Percent**	**Cumulative Percent**
0-1yrs	52	20.1	20.2	20.2
1-2yrs	38	14.7	14.7	34.9
2-3yrs	83	32.0	32.2	67.1

School	Frequency	Percent	Valid Percent	Cumulative Percent
3yrs and more	84	32.4	32.6	99.6
None	1	0.4	0.4	100.0
Total	258	99.6	100.0	
Missing	1	0.4		
Total	259	100.0		

Measurement of scales for frequency items

Scales		Performance Expectancy (PE)				Effort Expectancy (EE)			
		PE1	PE2	PE3	PE4	EE1	EE2	EE3	EE4
Strongly disagree	N	15	14	17	23	17	14	18	6
	%	5.79	5.43	6.56	8.88	6.56	5.41	6.95	2.32
Disagree	N	12	22	26	30	23	30	25	9
	%	4.63	8.53	10.04	11.58	8.88	11.58	9.65	3.47
Neutral	N	23	32	52	89	40	47	42	24
	%	0.89	12.40	20.08	34.36	15.44	18.15	16.22	9.27
Agree	N	100	111	105	78	104	112	102	66
	%	38.61	43.02	40.54	30.12	40.15	43.24	39.38	25.48
Strongly agree	N	109	79	59	39	75	56	72	154
	%	42.08	30.62	22.78	15.06	28.96	21.62	27.80	59.46
Missing		0	1	0	0	0	0	0	0
Total		259	258	259	259	259	259	259	259

Scales		Social Influence (HM)			Facilitating Conditions (HM)			
		SI1	SI2	SI3	FC1	FC2	FC3	FC4
Strongly disagree	N	131	111	64	92	78	45	58
	%	50.78	42.86	24.71	35.52	30.12	17.37	22.39
Disagree	N	68	76	60	72	67	63	75
	%	26.36	29.34	23.17	27.80	25.87	24.32	28.96
Neutral	N	27	19	32	52	33	48	85
	%	10.47	7.34	12.36	20.08	12.74	18.53	32.82
Agree	N	23	36	75	27	55	70	27
	%	8.91	13.90	28.96	10.42	21.24	27.03	10.42
Strongly agree	N	9	17	28	16	26	33	14
	%	3.49	6.56	10.81	6.18	10.04	12.74	5.41
Total		258	259	259	259	259	259	259

Scales		Hedonic Motivation (HM)				Habit (HM)			
		HM1	HM2	HM3	HM4	H1	H2	H3	H4
Strongly disagree	N	19	9	13	10	64	30	12	37
	%	7.34	3.49	5.02	3.86	24.71	11.63	4.63	14.34
Disagree	N	19	19	26	23	33	55	32	57
	%	7.34	7.36	10.04	8.88	12.74	21.32	12.36	22.09
Neutral	N	33	41	60	54	18	34	83	57
	%	12.74	15.89	23.17	20.85	6.95	13.18	32.05	22.09
Agree	N	93	97	105	109	27	48	92	77
	%	35.91	37.60	40.54	42.08	10.42	18.60	35.52	29.84
Strongly agree	N	95	92	55	63	117	91	40	30
	%	36.68	35.66	21.24	24.32	45.17	35.27	15.44	11.63
Missing	N	0	1	0	0	0	1	0	1
Total		259	258	259	259	259	258	259	258

Scales		Behavioural Intention (BI)			Use Behaviour Index (UI)			
		BI1	BI2	BI3	UI1	UI2	UI3	UI4
Strongly disagree	N	14	11	11	24	24	32	11
	%	5.41	4.26	4.26	9.27	9.27	12.40	4.25
Disagree	N	16	31	31	22	39	15	5
	%	6.18	12.02	12.02	8.49	15.06	5.81	1.93
Neutral	N	46	90	90	182	145	47	23
	%	17.76	34.88	34.88	70.27	55.98	18.22	8.88
Agree	N	73	82	82	23	35	105	71
	%	28.19	31.78	31.78	8.88	13.51	40.70	27.41
Strongly agree	N	110	44	44	8	16	59	149
	%	42.47	17.05	17.05	3.09	6.18	22.87	57.53
Missing	N	0	1	1	0	0	0	0
Total		259	258	258	259	259	258	259

Descriptive analysis

Variable	N	Mean	Std Dev	Minimum	Maximum
Performance Expectancy (PE)	259	3.71	0.87	1.00	5.00
Effort Expectancy (EE)	259	3.87	0.79	1.00	5.00
Social Influence (SI)	259	2.26	0.86	1.00	4.67
Facilitating Conditions (FC)	259	2.55	0.99	1.00	5.00
Hedonic Motivation (HM)	259	3.8	0.91	1.00	5.00
Habit (H)	259	3.33	0.83	1.25	4.75
Behavioural Intention (BI)	259	3.67	0.92	1.00	5.00
Use Behaviour (UB)	259	3.42	0.67	1.00	5.00

Standardised results for path list and variance parameters

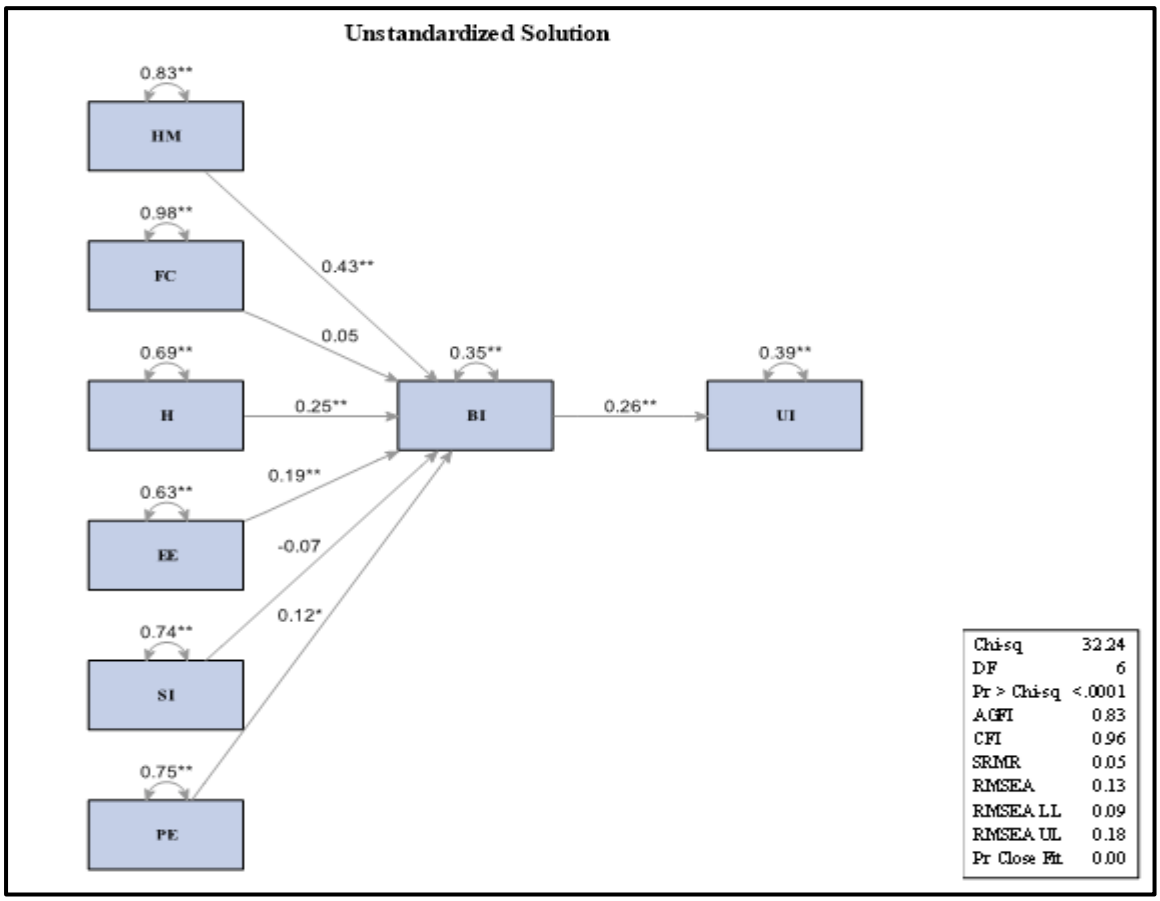
Standardised Results for Path List					
Path	Parameter	Estimate	Standard Error	t-Value	Pr > |t|
PE ===> BI	_Parm1	0.11179	0.05678	1.9691	0.0489
EE ===> BI	_Parm2	0.16600	0.06235	2.6625	0.0078
SI ===> BI	_Parm3	-0.06491	0.04253	-1.5263	0.1269
FC ===> BI	_Parm4	0.05698	0.04103	1.3887	0.1649
HM ===> BI	_Parm5	0.43056	0.04997	8.6171	<.0001
H ===> BI	_Parm6	0.22727	0.05021	4.5259	<.0001
BI ===> UI	_Parm7	0.35279	0.05451	6.4723	<.0001

Reliability and validity of construct

Cronbach's Coefficient Alpha			
Construct	Raw Variable	Standardised Variable	Number of items
Performance Expectancy	0.774868	0.774615	4
Effort Expectancy	0.691236	0.688899	4
Social Influence	0.691236	0.688899	3
Facilitating Conditions	0.794628	0.788020	4
Behaviour Intention	0.561964	0.554696	4

APPENDIX H: LIST OF FIGURES

The structural model



APPENDIX J: CONCEPTUAL MODEL

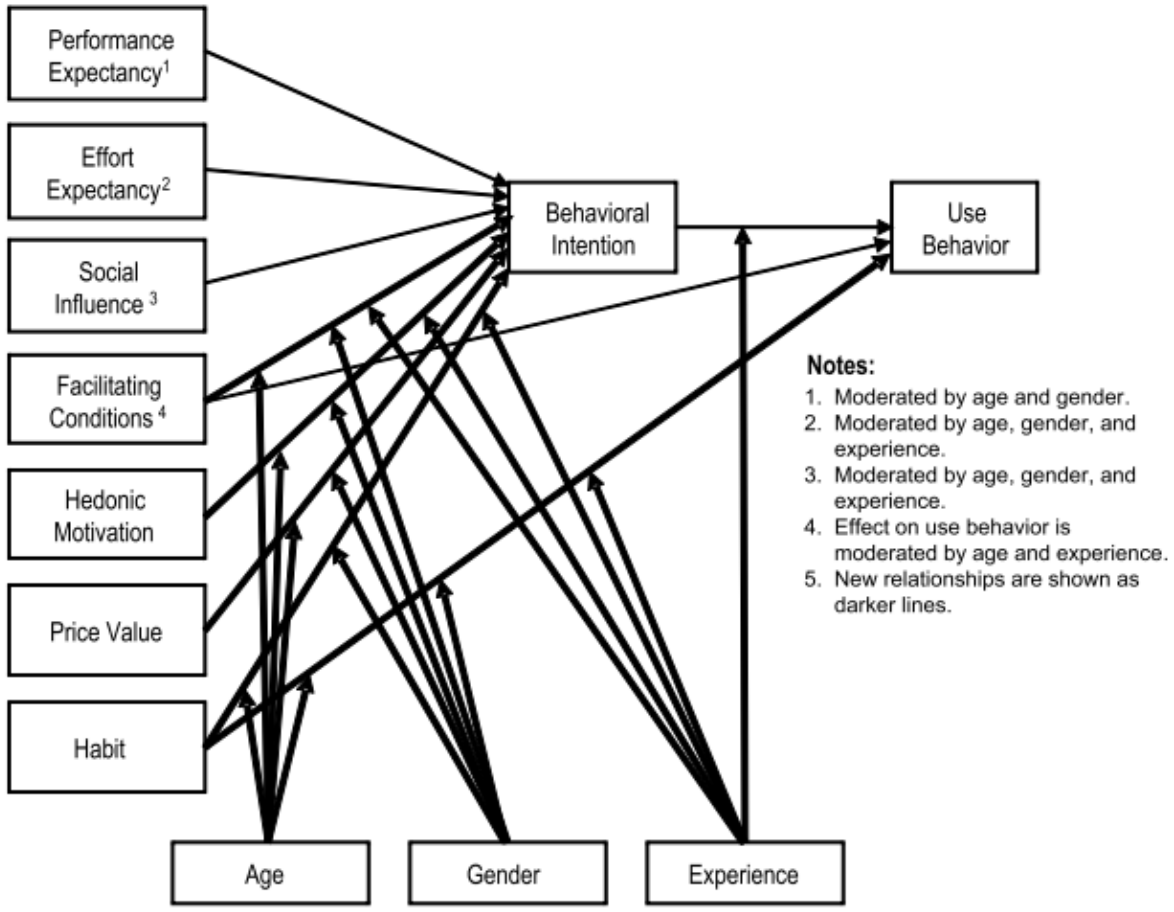


Figure 3.1: Unified Theory of Acceptance and Use of Technology 2

Source: Venkatesh, Thong and Xu (2012)

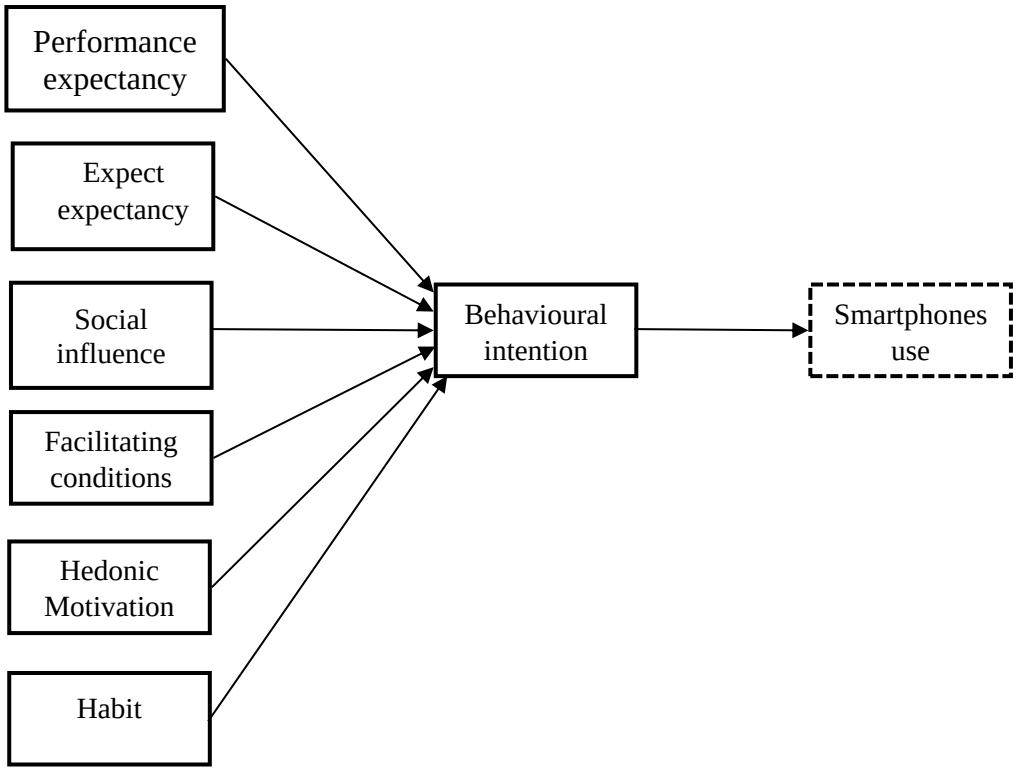


Figure 3.2: Conceptualised model to study of use of smartphones

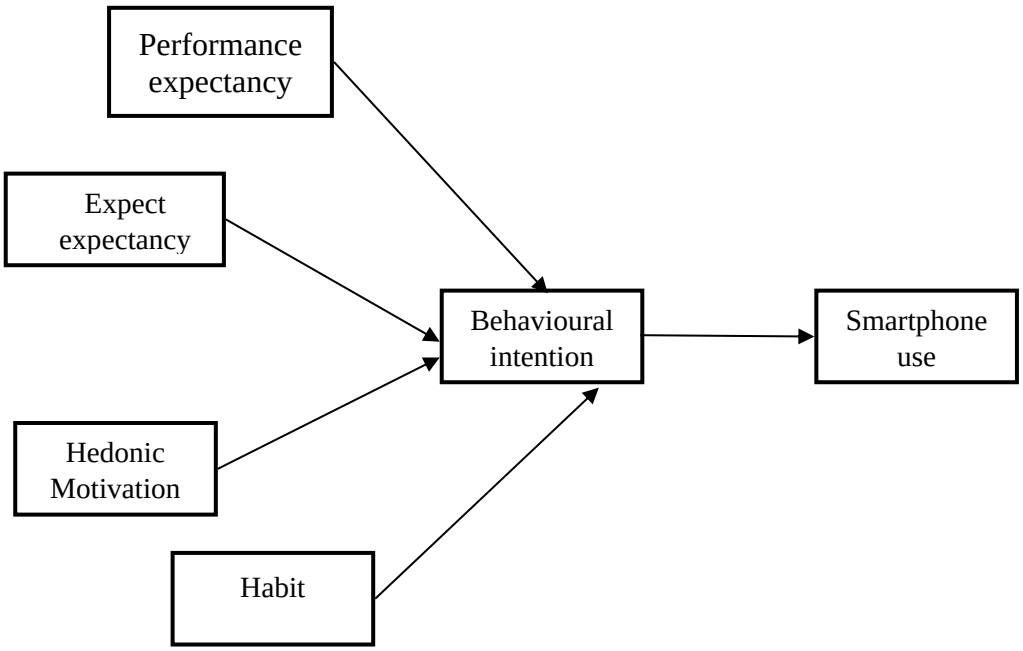


Figure 4.1: Effects of smartphone usage model – output model

APPENDIX I: EDITING CERTIFICATE

EASYDOC EDITING AND TRANSCRIBING SERVICES

CERTIFICATE OF ENGLISH EDITING

TO WHOM IT MAY CONCERN

This document certifies that the Masters Dissertation detailed below is edited for English Language, Grammar, Punctuation, and Spelling by the English Language and Grammar Editor at Easydoc Editing and Transcribing Services.

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DATE EDITED

Thursday 09 December 2021

DISSERTATION TITLE

Factors that Affect Smartphone Adoption by High School Students in Gauteng, Ekurhuleni Region

POSTGRADUATE DEGREE

Master of Science in Computing (MSCIT)
from CSET at the University of South Africa (UNISA)

DISSERTATION AUTHOR

Sekana Faith Mokwana

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Open Rubric